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No. 31.

Memoir upon the Vineyards and Wines of Champagne in France: Written in answer to certain Queries circulated by M. CHAPTAL. *By M.* GERMON, *of Epernay.*

(Concluded from page 91.)

Is Grafting attended with Advantage?

FIFTY years ago they used to graft the vines on the mountains, and they generally obtained very fine vines with large fruit. This plan has now been abandoned, because it has been discovered that a grafted vine does not last so long as an ungrafted one, and the grafted vine is always more tender and delicate; besides, it produces a poorer kind of wine.

How many Dressings are given to the Vines previous to the Vintage?

The first dressing, which is called *becherie*, (hoeing,) is given immediately after the frosts have disappeared.

In general, as soon as the bud of the vine makes its appearance the women proceed to prune, and the men

follow with the first dressing. This is a pernicious system; but the prejudices of the proprietors have not yet given way to the counsels of men of science.

The vines are pruned at the same time with the first hoeing; but this method is not practised in the Marne district, where they prune subsequently to the hoeing: it frequently, however, saves the prunings from the effects of the frost, and presents a resource to the proprietor if the vines have suffered from this accident.

Two other dressings are afterwards given, one in June and the other in August; but some proprietors, who are jealous of the good qualities of their vines, give them a third dressing in September.

What are the Processes employed in gathering and pressing the Produce of the Vintage?

In order to make red wine,—when the fruit is perfectly ripe, the black grapes only are carefully picked and gathered. The white grapes are laid aside, as well as those red ones which are not ripe; and these are afterwards made into wine of an inferior quality. The ripe red fruit, when thus separated, is put into panniers, or small wooden boxes called *barillets* or *cuvelets*, and conveyed on the backs of beasts of burden to the pressing place: here they are pressed by small portions at a time, and the juice then put into a tub to ferment. In performing this operation some proprietors employ an utensil called a martyr, which is very useful. This is an oblong coffer, less than the diameter of the fermenting tub, and about a foot or eighteen inches high. This coffer rests upon beams placed across the fermenting-tub, and its bottom and sides are pierced with holes in such a manner as to allow the expressed juice of the grapes to flow through into the tub.

How long is the Wine allowed to ferment?

It would be difficult to fix any precise time for the duration of the fermentation; this depends entirely upon the nature and maturity of the fruit, and upon the influence of the atmospheric air. Grapes gathered in the morning will more slowly go into fermentation than those which have been gathered after noon-day in fine weather:—mists, rains, and hoar-frosts, all retard fermentation more or less.

In some years, three or four days are sufficient for producing a fermentation sufficient for preparing the fruit for the press:—in other years, ten, fifteen, and even twenty days are required.

By what Sign is it ascertained that the Fruit has attained a proper Degree of Fermentation?

We cannot assign any certain symptoms that the wine has sufficiently fermented, as the period proper for placing the bruised fruit into the presses depends upon various causes; upon the pleasure and experience of the proprietor, and upon the quality and colour which he wishes to give to his wine. Some place the fruit in the press at the strongest degree of fermentation, and others when it has slackened.

After the fermentation begins, in order to hasten it, they squeeze down the fruit in such a manner as to keep the must always uppermost: poles armed with spikes are used for this purpose; or, what is better, some strong workmen descend into the vat and tread down the fruit: the fermentation thus becomes more equal and more general; and when it has proceeded far enough, the must is carried to the press and the wine is made.

In ordinary-years, when a lighted candle cannot be held over the tub without going out; when the grapes

and husks ascend to the top, notwithstanding their being repeatedly pressed down; when the must undergoes a kind of ebullition; and lastly, when the colouring particles are sufficiently decomposed to satisfy the wishes of the proprietor,—it would be dangerous to push the fermentation any further, as in that case the wine might assume a dry and hard taste which even time could not correct, particularly in Champagne wines, which are prized on account of their pleasantness and lightness. The most consummate experience is sometimes unsuccessful in the above operations, and there has been no instrument yet invented which can be depended upon.

Is it advantageous to mix the extractive Liquor of the Tubs with that which is produced by pressing?

This may be answered in the affirmative, with respect to the whole of Champagne;— and it is very advantageous for the following reasons:

1st, The wine made from the tub would be paler in colour and more delicate than that which is expressed from the husks.

2dly, The wine which came from the press only, would he harder, stronger, and redder, than the other; so that from the same tub we should certainly have two different kinds of wine:—The mixing of them is therefore indicated by experience, and it is at all times necessary to have wines of an equal quality.

Is it advantageous to bruise the Stones of the Grapes?

This operation depends upon the season, and upon the ripeness and nature of the fruit. When the fruit is small and the stone large, or when the fruit has not acquired all its maturity, the stones should be bruised.

When the fruit is full and well grown, when the season has been rather dry than humid, this operation may

be omitted. It has been ascertained, however, that the strong and rough taste of the stones is necessary, as one of the constituent parts of wine.

To what Accidents are Red Wines liable when in the Casks?

The accidents to which red wines are liable, are yellowness, muddiness, and a wormwood taste. These accidents happen when the wines are kept in badly aired cellars, or when the fruit has been damaged during the vintage season by frosts or continual rains.

How are the Red Wines managed?

When the red wine which comes out of the tub, and that which has been expressed from the husks, are well mixed together in a vat procured for the purpose, the whole is poured into new puncheons previously rinsed with hot water; but they are not filled at once, because the wine always ferments for a few days longer: as the fermentation ceases they are filled and bunged up, leaving a small spiggot in the bung in order to allow the gas to pass out: when the fermentation has entirely ceased the puncheon is hermetically closed.

About the end of December, and if possible in dry weather, the wine is drawn off and freed from the greatest part of the lees.

About the middle of May, before the warm season commences, the wine is again drawn off clear. Before putting the puncheons into the cellar they are furnished with new hoops, where they are kept during the summer, or till they are sold, otherwise their contents would be spoiled.

What is the Method of clarifying Red Wines?

This consists in drawing off the wine a third time.

The whites of five or six fresh eggs are diluted in a chopin of water; and this quantity is sufficient for each piece or puncheon containing two hundred and forty bottles.

There are only two hundred bottles in a puncheon of white wine.

The whites of eggs are well beaten up and then thrown into the puncheon, the contents of which are then briskly stirred up by a cleft stick.

This operation is performed previous to bottling the wine or sending it off to a market.

At what Age should Red Wines be bottled?

In general, the red wines of *Haute Montagne* are bottled in the month of November succeeding the vintage, that is, thirteen months afterwards. This season of the year is fixed upon because all germination has ceased, and Nature is in a state of perfect repose; thereby all fermentation is avoided; and red wines may therefore be safely bottled from the first of October until the end of December: at any other season great inconveniencies would arise; for I know of nothing worse than red wine bottled in spring time; it retains a slight degree of fermentation, and is very disagreeable to the taste.

There are some excellent and generous wines which can remain three or four years on their lees: of this description are the wines of Saint Thierry.

How long will Red Wines keep in Bottles?

The more body and spirit the wine has, the better is it preserved in bottles: the more tender, delicate, and light it is, the more difficultly is it kept.

This is the reason why the wines of Mailly, Chiny, Chenay, and Hermonville, keep worse than those of Verzenay, Bouzy, and Verzy; and these last worse than

those of Saint Thierry. To conclude:—We may safely venture to say, that the best red wines of Haute Montagne will keep in good cellars for six, eight, ten, and twelve years.

What Degree of Temperature, according to Reaumur's Thermometer, ought the Cellars to have?

The cellars in Champagne are from twenty-five to forty feet in depth, particularly those which are dug in beds of chalk, and in which it is necessary to dig low, in order to obtain such a solidity of earth above, as to render an arch unnecessary. It results from experiments made by Messrs. Dubois, merchants at Rheims, that several good thermometers placed in various situations in their cellars, always marked five degrees below the temperature of the atmosphere. The variations between winter and summer were not half a degree, and could not be noted.

What is the Cost of an Acre of Vineyard?

FIRST CLASS.

	Livres.
In Haute Montagne . .	2000
In Basse Montagne . .	1000
In Saint Thierry . .	900

SECOND CLASS.

	Livres.
In Haute Montagne . .	900
In Basse Montagne . .	600
In Saint Thierry . .	300

The convent lands, and what is called Clos Saint Thierry, are not taken into this computation.

What is the annual Expense of Cultivating an Acre of Vineyard, including the Expense of Vintage and of Pruning?

	Livres.
To the vine dresser . . .	50
Props	18
Mending them, and carriage, &c.	40
Prunings and contributions . .	24
Four puncheons	40
Expense of vintage . . .	28
	200

General Observations.

We have only mentioned the culture of vines in general, without detailing those of the high and low grounds separately. There are many vineyards, however, and particularly in Saint Thierry, where the greater part of the vines is always raised to the height of about five feet, and supported by props of oak, six feet high, and an inch in diameter. This kind of vine can only answer in strong and vigorous ground.

The difference between the culture of the high and low vineyards, consists in the shaping, tyeing, and pruning.

1st, Shaping consists in choosing from the sucker the best stalk, in preference to others which are cut off, and all the small collateral shoots are lopped off.

2dly, The tyeing is effected when the sap is most abundant, and the bud already developed: the above single stalk is bent like a hoop, and tied to the prop in two or three places.

3dly, Pruning consists in reinserting into the earth, and into small and long holes, every ten or fifteen years, the old sucker, upon which three or four stalks are left,

which are also buried in the earth; and they send out an excellent plant for the ensuing year. This operation is called *ravallement*, and is very different from the pruning practised in the department of the Marne.

An intelligent proprietor, who has a large extent of vineyard, should bury some vines (*ravaller*) every year, in order to have a sure and constant supply of plants for replanting.

The methods of treatment are in every respect the same with high and low plants.

No. 32.

*Account of the Process employed in making Cheshire Cheese.**

Preparation of the Rennet.

WHEN the maw skin comes from the butcher, the chyly matter is taken out, and the skin cleaned from slime and every apparent impurity, by wiping or gently washing. The skin is then filled nearly full of salt, and, placing a layer of salt upon the bottom of a mug, the skin is laid flat upon it: this mug is large enough to hold three skins in a course: each course of skins should be covered with salt; and when a sufficient number of skins are thus placed in the mug, that mug should be filled up with salt, and, with a dish or slate over it, be put in a cool place, till the approach of the cheese making season the following year. The skins are then all taken out and laid for the brine to drain from them; and being spread upon a table, they are powdered on each side with fine salt, and rolled smooth with a paste

* Tilloch, vol. 11, p. 230. From the *Agricultural Report of Cheshire County.*

roller, which presses in the salt. After that, a thin splint of wood is stuck across each of them to keep them extended while they are hung to dry. Take all the maw skins provided for the season, pickled and dried as before; put them into an open vessel or vessels, and for each skin pour in three pints of pure spring water. Let them stand twenty-four hours, then take out the skins, put them into other vessels; add for each one pint of spring water, let them stand for twenty-four hours as before. On taking the skins out the second time, gently stroke them down with the hand into the infusion. The skins are then done with. Mix those two infusions together, pass the liquor through a fine linen sieve, and add to the whole a quantity of salt, rather more than is sufficient to saturate the water; that is to say, until a portion of the salt remains undissolved at the bottom of the vessel. The next day, and also the summer through, the scum as it rises is to be clearly taken off; and as the liquor should not be suffered to remain without a portion of undissolved salt at the bottom, it will be necessary to add frequently fresh salt, as that which was dissolved will gradually form itself into crystals, and be taken off with the rising scum. Somewhat less than a wine half pint of this preparation will be generally sufficient for sixty pounds of cheese. Whenever any of this liquid is taken out for use, the whole should be well stirred up.

Colouring for the Cheshire Cheese.

The colouring for cheese is, or at least should be, Spanish annotta; but as soon as colouring became general in this country, a colour of an adulterated kind was exposed for sale in almost every shop: the weight of a guinea and a half of real Spanish annotta is sufficient for a cheese of sixty pounds weight. If a considerable part of the cream of the night's milk be taken for butter, more

colouring will be requisite. The leaner the cheese is, the more colouring it requires. The manner of using annotta is, to tie up in a linen rag the quantity deemed sufficient, and put it into half a pint of warm water over night. This infusion is put into the tub of milk in the morning with the rennet infusion; dipping the rag into the milk, and rubbing it against the palm of the hand as long as any colour comes out.

Setting the Cheese together.

It is, we believe, generally admitted, that not only the quantity, but the quality of the curd, as to texture, namely, toughness or otherwise, depends in a great measure upon the length of time the cheese is in coming; and that the time, again, depends on the quantity and strength of the coagulum used, the state of the atmosphere, and the heat of the milk when put together. In this stage of the art, where a degree of accurate certainty seems to be required, there is no other guide but the hand and the external feelings: the thermometer of a Cheshire dairy-woman is constantly at her fingers' ends: accordingly the heat of the milk when set, is endeavoured to be regulated by the supposed warmth of the room and the heat of the external air; having reference also to the quantity and strength of the steep, so that the milk may be the proper length of time in sufficiently coagulating, which is generally thought to be about an hour and a half. The evening's milk of suppose twenty cows having stood all the night in the cooler and brass pans, the cheesemaker in summer, about six o'clock in the morning, carefully skims the cream from the whole of it, observing first to take off all the froth and bubbles, which may amount to about a pint; this, not being thought proper to be put into the cheese, goes to the cream mug to be churned for butter; and the rest of the cream is put into a brass pan.

While the dairy-woman is thus employed, the servants are milking the cows, having previously lighted a fire under the furnace, which is half full of water. As soon as the night's milk is skimmed, it is all carried to the cheese-tub, except about three fourths of a brass pan full, viz. three or four gallons, which is immediately placed in the furnace of hot water in the pan, and is made scalding hot; then half of the milk thus heated in the pan is poured also into the cheese-tub, and the other half is poured to the cream, which, as before observed, is skimmed into another brass pan. By this means all the cream is liquified and dissolved so as apparently to form one homogeneous or uniform fluid, and in that state it is poured into the cheese-tub; but before this is done several bowls or vessels full of new milk will generally have been poured into the cheese-tub, or perhaps the whole morning's milk. Care is taken to skim off all the air bubbles which may have formed in pouring the new milk into the cheese-tub.

The rennet and colouring being put into the tub, the whole is well stirred together, a wooden cover is put over the tub, and over that is thrown a clean linen cloth. The usual time of coming is an hour and a half, during which time it is to be frequently examined: if the cream rises to the surface before the coming takes place, as it often does, the whole must be stirred together, so as to mix again the milk and cream, and this as often as it rises, until the coagulation commences. A few smart strokes on different sides of the tub with the cheese-ladder, &c. will forward the coagulation, if it is found too long in forming. If the dairy-woman supposes the milk, &c. to be accidentally put together cooler than she intended, or that its coolness is the cause of its not coming, hot water or hot milk may be poured into it, or hot water in a brass pan may be partially immerged therein; but

this must be done before it is at all coagulated; for, after that takes place, though but imperfectly, it must not be tampered with so as to break the forming curd, for a considerable part of the cream would thereby be directed into the whey, and the quantity of curd much lessened. Before the coagulation takes place, an additional quantity of rennet may also be put in, if thought necessary; but this will, after coagulation, be added with little effect, as no means can be used to mix it with the whole mass without disturbing the forming curd. If the cheese has been set together hotter than it was meant to be, the opposite means, under the same precautions, may be recurred to. But the more general practice is, to suffer the process to proceed hot as it is, until the first quantity of whey is taken off; a part of which, being set to cool, is returned into the tub to cool the curd. When the cheese happens to come much sooner than a proper time, owing to too great a degree of heat in the milk in setting or putting together, or too great a strength of steep, there is less curd, and it is considerably tougher than when the milk has been set cooler together than usual, or when too little steep has been used. In the latter case, the curd is exceedingly tender: and, when that so happens, a part of the whey is taken out of the cheese-tub, and heated as much as may be thought sufficient to give to the curd, when mixed with it, a proper degree of toughness. In an hour and a half, as mentioned before, if all goes on well, the coagulation will be formed. This point is determined by gently pressing the surface of the milk with the back of the hand.

Breaking down the Curd, Gathering, &c.

If the milk has been set together very warm, the curd, as before observed, will be firm: in this case, the usual mode is to take a common case knife, and make inci-

sions across it to the full depth of the knife's blade, at the distance of about one inch; and again crossways in the same manner, the incisions intersecting each other at right angles. The whey rising through these incisions is of a fine pale green colour. The cheese-maker and two assistants then proceed to break the curd; this is performed by their repeatedly putting their hands down into the tub, the cheese-maker with the skimming dish in one hand breaking every part of it as they catch it, raising the curd from the bottom, and still breaking it. This part of the business is continued till the whole is broken uniformly small: it generally takes up about forty minutes, and the curd is then left covered over with a cloth for about half an hour to subside. If the milk has been set cool together, the curd, as before mentioned, will be much more tender, the whey will not be so green, but rather of a milky appearance. The cheesemaker in this case, instead of the knife, has recourse to the skimming dish, the edge of which she holds perpendicular to the surface of the whey in the tub, and dips it gently an inch or two into the curd, turning it over, until the whole surface is thus turned. The breaking then proceeds as before; but a cautious and gentle mode of doing it is more necessary than in the former case. Rather more time, of course, is necessary for breaking down a cold than a hot cheese; but when sufficiently broken, it is covered over, and left to subside as before. After standing about half an hour, as much whey is taken out of the tub into the brass pans as conveniently may be, without taking any of the curd with it. The bottom of the tub is now set rather a-tilt, the curd is collected to the upper side of it, a board is introduced of a semicircular form to fit loosely one half of the tub's bottom. This board is placed on the curd, and a sixty pound weight upon it, to press out the whey, which draining to the lower side of the tilted

tub, is laded out into brass pans. Such parts of the curd as are pressed from under the board, are cut off with a knife, placed under the weighted board, and again pressed. This is repeated again and again, the whey being constantly laded out as it drains from the curd. The whole mass of curd is then turned upside down, put on the other side of the tub, again pressed, pared, and pressed as before.

The board and weight being removed, the curd is cut into several pieces of about eight or nine inches square, piled upon each other, and pressed with the board and weight, repeating the cutting and piling, as long as any whey drains from it. It scarcely need be added, that the more gently the whole of the business in the tub is performed, the more perfect will be the separation of curd and whey.

The next thing is to break the curd in a brass pan. After being pressed in the tub as long as any considerable quantity of whey drains from it, the curd is cut into nearly three equal portions; one of which is taken into a brass pan, and is there, by two women, broken exceedingly fine. As soon as it is coarsely broken, a large handful of salt is added, which in the subsequent breaking is well mixed with the curd; that portion of curd, being sufficiently broken, is put into a cheese vat, which is placed to receive it on a cheese-ladder over the cheese-tub: the vat is generally furnished with a coarse cheese-cloth. The second and third portions of the curd are treated in the same manner, and emptied into the vat; sometimes five or six times the quantity of salt is added to the middle portion of the curd; others, salt all alike. The breaking takes up more or less time as the cheese was set together hotter or colder; half an hour is perhaps the longest time.

Thrusting or Hand-pressing the Cheese into the Vat.

THE curd, when put into the cheese-vat in its broken state, is heaped above the vat in a conical form, to prevent it from crumbling down; the four corners of the cheese-cloth are turned over it, and three women, placing their hands against the conical part, gently but forcibly press it in nearly a horizontal direction, constantly shifting their hands when any portion of the curd is starting from the mass, and turning down and folding up the cloth as occasion requires. As soon as the curd adheres together so as to admit it, a small square board, with a corner of the cloth under it, is put on the top of the conical part of the curd, with a sixty pound weight upon the board. Several iron skewers are at this time stuck in the cone, and also through holes in the sides of the vat. Several use a wooden lever to press down the cheese.

The employment of the women is now drawing out and putting in the skewers; thrusting and keeping together the portions of the curd, that the power of the weight or lever displaces. This operation is continued until the whey, which at first ran from it freely, begins to be discharged by drops; the weight and skewers are then removed and one woman takes up the corners of the cloth, while the others break the curd half way to the bottom of the vat, as small as they can.

Some people use a wooden or tin hoop, nine inches broad, instead of holding up the corners of the cloth during this breaking. After the upper half of the cheese is thus broken, a weight or other power is again applied to it, and is skewered and thrusted as before: at first the whey again runs freely, and the operation is continued as long as those means will press out a drop of whey. Two of the women then take the four corners of the cloth, the

skewers, &c. being removed; and the other woman lays hold of the vat which is drawn from the cheese; and after rinsing it in warm whey, and putting another clean cloth over the upper part of the cheese, it is returned inverted into the vat again, and, being placed on the ladder over the tub, is broken half way through, as before; thrusting, weighting, and skewering, &c. is repeated, and continued from two to four hours, or as long as a drop of whey can be extracted from the cheese.

Putting the Cheese into the Press.

When no more whey can be extracted by the aforesaid means, the cheese is again turned into the vat and rinsed, as before, with warm whey. The cloth now made use of is larger and finer than the former, and is so laid on one side it shall be level with the side of the vat, and on the other wrap over the whole surface of the cheese, and the edges put within the vat; thus perfectly inclosing the whole cheese in the cloth. In this stage of the business, the cheese is still higher than the edge of the vat; and to preserve it in due form recourse is had to a tin binder or hoop, about three inches broad, which is put round the cheese on the outside of the cloth, and the lower edge of the binder pressed down within the vat, so low as that the upper edge of it may be level with the surface of the cheese. The cheese is then carried to the press; and a smooth strong board being placed over it, the press is gently let down upon it; the usual power of which press is about fourteen or fifteen hundred pounds weight.

As soon as the cheese is put into the press, it is well skewered; the skewers are of a strong iron wire, eighteen or twenty inches long, sharp at the points, and turned with a bow at the other end. The vat and tin binder

have holes to receive the skewers, especially the binder, which holes are seldom more than one inch from each other. As the press stands close to a wall, only one side of the cheese can be skewered at a time; therefore as many skewers are stuck in different directions as conveniently may, leaving as many holes unskewered as are skewered, to give an opportunity of changing the holes. The business of skewering continues till the next morning at six o'clock, and in that time the oftener they are shifted the better; every second time of shifting them the cheese is turned half way round in the press, to come at the other side of it. In half an hour from the time the cheese is first put into the press, it is taken out again and turned in the vat into another clean cloth. At this time the edges of the cheese are pared off, if they have become sharp under the press; but as the vats are now usually made with the angles rounded, the paring is rendered unnecessary, the vat being wiped dry before the cheese is returned to it.

When the cheese is thus the first time taken out of the press, it is the custom of some places to put it into warm, and in others into hot whey, where it stands an hour or more. It is then taken out, wiped dry, and after it has stood till cool, it is returned back to the press. This is done with a view to hardening its coat, that it may stand the better. At six o'clock in the evening the cheese is again turned in the vat into another clean cloth. At this and the former turning, some dairy women prick the upper surface of the cheese all over, an inch or two deep, before it is replaced under the press, with a view of preventing blisters. At six o'clock in the morning it is again turned in the vat, with a clean cloth as before. The skewers are now laid aside. When the next day's cheese is ready for the press, the former one is again turned in the vat with a clean cloth, and put under ano-

ther press. At six o'clock in the evening, and at six the morning following, it is again turned in the vat, using at these two last turnings two cloths finer than those before used, in order that as little impression as possible from the cloth may remain on the coat of the cheese.

Salting the Cheese.

FOUR or five days after the cheese has been under the press, a fresh fine cloth is put under it, which serves only as a lining to the vat, and is not turned over the upper surface of the cheese, as has been hitherto the case. It is then taken and placed nearly midside deep in brine in a salting tub; the upper surface of the cheese being covered all over with salt. It stands generally about three days in the salting tub; is turned daily, and each turning well salted, the cloth being twice changed in the time. The cheese is then taken out of the vat, and in lieu of which a wooden girth or hoop is made use of, equal in breadth nearly to the thickness of the cheese: in this it is placed on the salting-benches, where it stands about eight days, being well salted all over, and turned each day. The cheese is then washed in luke-warm water; and after being dried with a cloth, it is placed on the drying-benches, where it remains about seven days: it is then washed in warm water, as before, with a brush, and wiped dry with a cloth: after it has stood about two hours from this washing, it is smeared all over with about two ounces of sweet whey butter, and then placed in the warmest part of the cheese-room.

Cheese-Room.

DURING the first seven days it is rubbed every day well over, and generally smeared with sweet whey butter. Afterwards a circular space is left unrubbed of four

or five inches diameter, in the centre of each side the cheese, which, as long as it is afterwards kept, is, or should be, turned daily, and rubbed three times a week in summer and twice in winter. Scraping the rind should be rendered unnecessary by frequent cleanings. In a warm room the coat will be easily prevented from rising. These cheese-rooms are commonly placed over the cow-houses, and this is done with a view to obtain that moderate and necessary degree of temperature so essential to the ripening of cheese, to which the heat arising from the cattle underneath is supposed very much to contribute. The most desirable covering for a cheese-room, as contributing to that temperature so much desired, is thatch, for reasons that must be obvious. Before the cheese is brought into the rooms, the floors are mostly well littered with what the farmers here call *sniddle*, though wheat straw is frequently made use of for this purpose, but the knots of it are apt to leave an impression on the cheese. The afterneath of grass well dried seems to be a good substitute for sniddle.

No. 33.

Description of an Apparatus of Tubes for facilitating the driving of Copper Bolts into Ships. By Mr. Richard Phillips.*

(With an engraving.)

MR. Richard Phillips, of Bristol, in several letters sent to the Society, states, that he had invented a me-

* Nicholson, vol. 3, p. 36. From the *Transactions of the Society for the Encouragement of Arts, &c.* for 1801.—The Society adjudged a reward of forty guineas to the inventor. Models are in their repository.

thod of driving copper bolts into ships, without splitting the heads or bending them; and that by means of tubes contrived by him for the purpose, this could be effected without difficulty, and had been satisfactorily executed in the presence of several of the principal ship-builders of Bristol.

A certificate accompanied these letters, from Mr. William James, and Mr. Samuel Hast, ship-builders, and also from Mr. George Winter, of Bristol, testifying that they had tried the experiment of driving copper bolts through the jointed cylinder invented by Mr. Phillips; and that they so far approve of it, that they mean to adopt the general use of them, for driving bolts in all directions, particularly on the outside of ships, whether iron or copper; as this method not only prevents the bolts from bending, but keeps the heads from splitting, and enables the bolts to be driven much tighter, than by any other means with which they were acquainted. They further add, that by the application of Mr. Phillips's cylinder and punch, a copper bolt which had been crippled at the edge of the hole, and which could not be started by a mall, went up with ease in a perpendicular direction in the flat of a ship's bottom, not four feet from the ground.

This certificate was witnessed by Mr. William Holden.

The same facts are also certified by Mr. Thomas Walker, and Mr. James M. Hillhouse, of Bristol, who add their opinion, that the adoption of this invention in the different dock-yards of the kingdom, will prove very advantageous.

Since Mr. Phillips's first application to the Society for a premium, he has made a considerable improvement in the construction of his tubes. The description and engraving hereunto annexed are of the improved kind: mo-

dels of both are, however, preserved in the Society's repository, for public inspection.

The instrument employed for driving the bolts, consists of a hollow tube formed from separate pieces of cast iron, which are placed upon the heads of each other, and firmly held thereto by iron circles or rings over the joints of the tubes. The lowest ring is pointed, to keep the tube steady upon the wood. The bolt being entered into the end of the hole bored in the wood of the ship, and completely covered by the iron tube, is driven forward within the cylinder by an iron or steel punch, placed against the head of the bolt, which punch is struck by a mall: and as the bolt goes further into the wood, parts of the tubes are unscrewed and taken off, till the bolt is driven home into its place up to the head.

The tubes are about five inches in circumference, and will admit a bolt of seven-eighths of an inch in diameter.

Reference to the Engraving of Mr. R. Phillip's Method of driving Bolts into Ships. Plate 5, Fig. 3, 4, 5, 6.

Fig. 3.

A. The copper bolt, with one end entered into the wood, previous to fixing the tube.

B. A piece of timber, or ship's side, into which the bolt is intended to be driven.

Fig. 4.

CCCC. The parts of the iron tube fastened together, ready to be put on the bolt A.

DDDDD. Iron or brass rings with thumb-screws, placed over the joints of the tube, to hold them firm together.

EEEEE. The thumb-screws, which keep the rings and tubes firm in their proper places.

F. Two points formed on the lower ring: they are to stick into the timber, and to enable the tube to be held firm in its place.

Fig. 5.

Shows the separation of the parts of the tube, which is effected by slackening the thumb-screws and rings.

To put them together, you slide the rings over the joints, placed as close as possible; then, by tightening the thumb-screws, you will have them firm together, and may continue the tubes to any length, from one foot to whatever number is required.

Fig. 6.

GH. Two steel punches or drifts, to be placed on the head of the copper bolt within the tube, whilst driving. The blow given upon the punch drives forward the bolt. The shortest of them should be used first, and, when driven nearly to its head, should be taken out of the tube, and the longer punch applied in its place.

No. 34.

Description of a Water Wheel. By Mr. J. Besant.*

[With an engraving.]

SIR—I beg leave to lay before the Society for the Encouragement of Arts, some observations respecting the common Undershot Water-wheel, and to point out the superiority of that of my invention.

* Nicholson, vol. 3, p. 49. From the *Transactions of the Society for the Encouragement of Arts, &c.*

First,—In common water-wheels more than half the water passes from the gate through the wheel, without giving it any assistance.

Secondly,—The floats coming out of the tail-water are resisted with almost the whole weight of the atmosphere, at the instant they leave the surface of the water.

Thirdly,—The same quantity of water which passed between the floats at the head, must of course pass between them at the tail, and consequently impede the motion of the wheel.

In the water-wheel of my invention,

First,—No water can pass but what acts, with all its force, on the extremity of the wheel.

Secondly,—The floats coming out of the water in an oblique direction, prevent the weight of the atmosphere from taking any effect.

Thirdly,—Although the new water-wheel is heavier than that on the old construction, yet it runs lighter on its axis, the water having a tendency to float it.

Fourthly,—By experiments made with the models, proofs have been shown, that the new wheel has many advantages over the common wheel, and that, when it works in deep tail water, it will carry weights in proportion of three to one, so that it will be particularly serviceable for tide-mills.

I hope on trial, before the Society, my invention will prove successful, and am, &c.

J. Besant.

No. 26, *Brompton.*

To Charles Taylor, Secretary.

Repeated experiments of the above invention were made by the Committee; from the result of which it ap-

Mr. Besant's Water Wheel.

Fig. 1.

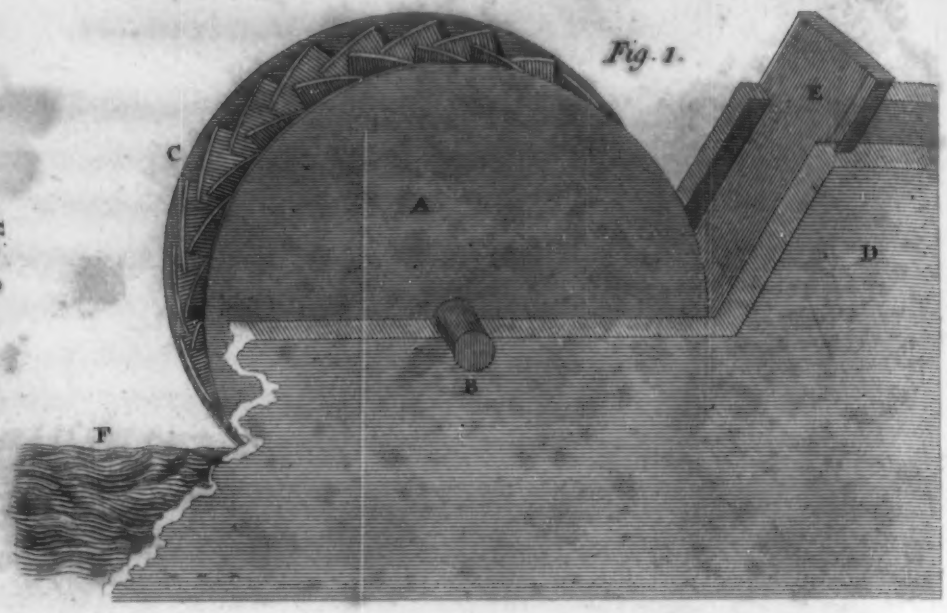


Fig. 2.

Davis's Vannels for Security

Fig. 3.

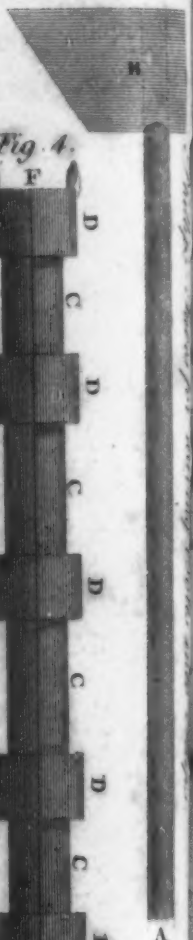


Fig. 4.

Fig. 5.

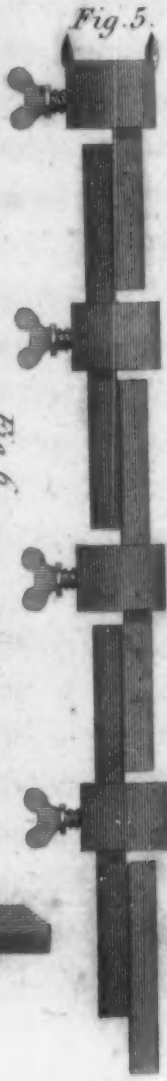


Fig. 6.

Fig. 7.

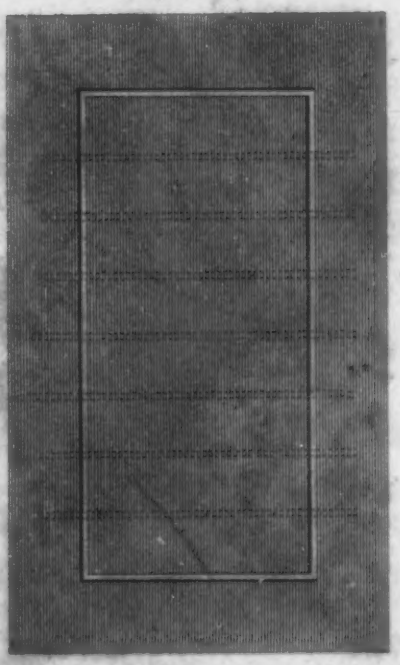


Fig. 8.

Fig. 9.

Emporium of Arts & Sciences Vol. 2. pl. 5.

C. Tiebout

peared to possess some advantages over the common wheel, and to have a greater power of action.

Description of the late Mr. Besant's Water-wheel. Plate 5, Fig. 1 and 2.

A. The body of the water-wheel, which is hollow in the form of a drum, and is so constructed as to be proof against the admission of water within it.

B. The axis on which it turns.

C. The float boards, placed on the periphery of the wheel. Each board is obliquely fixed firm to the rim of it, and to the body of the drum.

D. The reservoir, containing the water.

E. The penstock, which regulates the quantity of water running to the wheel.

F. The current of water which has passed the wheel.

Fig. 2. Is a front view of the water-wheel, showing the oblique direction in which the float boards C are placed on the face of the wheel.

No. 35.

Account of an Invention to secure the Pannels of Doors and Window Shutters from being cut out by House-breakers. By Mr. Joseph Davis.*

(With an engraving.)

SIR—I have for some time considered, that it would be of great benefit to the public, if a plan could be adopt-

* Nicholson, vol. 21, p. 177. From the *Transactions of the Society of Arts*, vol. 25, p. 101.—Ten guineas were voted to Mr. Davis for this invention.

ed to prevent the pannels of shutters or doors being cut out by house-breakers; and having tried a great number of experiments, I have at length succeeded in accomplishing the one I have the honour of forwarding to the Society for the Encouragement of Arts, &c.

This improvement consists in introducing tempered steel wires through the pannels and stiles at the distance of three inches, thereby not only making a door or shutter far superior in strength, but calculated to defy the attempts of the house-breaker in taking out a pannel. This improvement, though so far superior to any hitherto known for appearance and utility, will be attended with less expense. I have submitted the above plan to Messrs. Paynters, Coleman street, likewise to Messrs. Moffat and Co. Paternoster row, and to several gentlemen in that line of business, who all do me the honour to say, that it far surpasses any thing of the kind, that they have ever known or conceived, and that it will completely answer the purpose.

I have also sent the machine on which I bored the pannel, conceiving it to be an additional recommendation; with this machine, a boy may with ease bore the shutters, &c. which otherwise might be difficult for a man to accomplish.—I have the pleasure most respectfully to subscribe myself, yours, &c.

JOSEPH DAVIS.

CERTIFICATE.—We hereby certify, that Mr. Davis's improvement on doors and shutters, to prevent the pannels from being cut out by house-breakers, is the best that we have ever seen; and we are of opinion, that its being known will be an advantage to the public, and do therefore recommend it to the Society for the Encouragement

of Arts, Manufactures, and Commerce, for their consideration.

F. PAYNTER and Co. Coleman street.
E. COLEBACH, Minories.
J. TEASDALE, Paternoster row.
W. ROLFE.

April 22, 1807.

Reference to the Engraving of Joseph Davis's Invention for securing Window and Door Pannels, Plate 5, *fig.* 7, 8, 9.

FIG. 7. Represents a wooden pannel made in the common way, the dotted lines show the situations of the tempered steel rods within the pannel, the holes through which the rods were introduced on one side being closed up.

Fig. 8. Shows a section of the same, the small dots in the engraving denoting the place of the rods.

Fig. 9. Shows the instrument on which the pannels are laid to be bored. The borer passes through the holes L M of the two upright pieces, which keep the borer in a straight line to act upon the pannel laid upon the frame N.

No. 36.

On purifying Olive Oil for the Pivots of Chronometers.
By EZEKIEL WALKER, *Esquire.**

To Mr. Tilloch,

SIR—After all the experiments which have been made to decrease friction in time-keepers, nothing has

* Tilloch vol. 36. p. 372.

yet been found to answer this purpose so well as oil. But it has long been known that the application of this fluid to marine chronometers is attended with very pernicious consequences: for it gradually loses its fluidity during a long voyage, and adheres to the parts of the machine, by which all regularity in its performance is destroyed. Hence I was led to suppose, that time-keepers might be improved if oil of a better quality, than that which had been commonly used, could be procured.

About the year 1799, I made several experiments to separate from olive oil some of those impurities which it is known to contain, and I succeeded so far as to separate a thick mucilaginous matter from the best I could procure. This mucilage is an opake whitish matter, heavier than oil but lighter than water. The oil from which the mucilage has been taken is exceedingly transparent in a fluid state, but after it has been frozen it appears much whiter than common oil exposed to the same degree of cold.

About ten years ago I sent a small quantity of this oil to Mr. Barraud, requesting him to make trial of it, and in March, 1802, he gave me the following account:—

"I have," says Mr. Barraud, "just received a chronometer, in which the oil you favoured me with was used; which having performed a voyage of sixteen months to and from India, is vibrating as freely as at first, and keeping the rate it went out with to a fraction of a second."

Since that time Mr. Barraud has frequently applied to me for more of this oil, and continues to use it in his best time-keepers; but to be informed more particularly respecting it, I wrote to him requesting to know the re-

sult of his long experience, and the following extract is taken from his interesting answer:—

To Mr. Walker.

London, 13th October, 1810.

"Dear sir,—It is, I believe, upwards of ten years since you first favoured me with some of your purified oil, which I have ever since constantly applied to my chronometers; and on their return from a long voyage I have always found your oil in good condition, much better indeed than any which I had before been able to obtain; nor has the superior quality of yours been confined to my own observation.

"The late Mr. John Brockbank was complaining to me, some years ago, of the bad state in which he found the oil in his chronometers on their return from India, many of which had failed in consequence, although the oil he used was the best he could obtain. I then mentioned the success which had attended yours, and at his request furnished him with a small quantity, which he applied to his chronometers, and afterwards very gratefully acknowledged the advantage he had derived from its use; having found, on the return of his chronometers from India, your oil in excellent condition, and deemed it far superior in quality, for such purposes, to any he had before been able to procure.

"I have presented one of the last phials, which you favoured me with, to Mr. Vulliamy of Pall Mall, who purposes to give it a trial; but I hope you will be induced, by what has been already ascertained, to make your discovery known. I am, &c.

P. P. Barraud."

Pure oil, such as I have at different times sent to Mr. Barraud, may be obtained by attending to the following directions.

Put a quantity of the best olive oil into a phial with two or three times as much water, so that the phial may be about half full. Shake the phial briskly for a little time, turn the cork downwards, and let most part of the water flow out between the side of the cork and the neck of the phial. Thus the oil must be washed five or six times.—After the last quantity of water has been drawn off, what remains is a mixture of water, oil, and mucilage. To separate these from each other, put the phial into hot water for three or four minutes, and most part of the water will fall to the bottom, which must be drawn off as before.

The oil must then be poured into a smaller phial, which, being nearly full, must be well corked, set in a cool place, and suffered to stand undisturbed for three or four months, or until all the water shall have subsided, with the mucilage on the top of it, and the oil, perfectly transparent, swimming upon the top of the mucilage. When *time* has thus completed the operation, the pure oil must be poured off into very small phials, and kept in a cool place, well corked, to preserve it from the air.

E. WALKER.

Lynn, November 13, 1810.

NO. 37.

Account of the Methods employed for preventing Worms from destroying Bees. By Dr. THOMAS CHAPMAN.

Wrightstown, Bucks County, December 3, 1812.

SIR—In the year 1808, the bees in my neighbourhood were attacked by a kind of worm, and many of the swarms destroyed. These worms had before appeared

in the state of New York, and had gradually progressed through New Jersey, and I have now learned, that last year they were first observed in Chester County. From this it appears they are gradually progressing to the south, and will probably in a few years spread over the whole country. Their ravages are so destructive wherever they appear, that, unless some method of destroying them shall be discovered, they bid fair to exterminate the bees from our continent.

I therefore hope you will publish in the Emporium, for the information of the public, the following account of these worms, and of the methods that have been made use of to prevent their ravages.

The worms are of a light yellow colour; the body consists of twelve rings, and it has fourteen feet; the head is of a dark brown colour. They very much resemble a worm we often find in granaries of wheat. They are of various sizes; the largest about as thick as a writing quill, and an inch and an half in length.

These worms may be found in the mornings under the edges of the hive, where they lay out of the reach of the bees. When they have greatly increased, they either destroy the bees, or drive them from the hive. The combs will then be found nearly destroyed, and the remains of them matted together by a web, similar to a caterpillar's nest. I am not certain whether they devour the honey or the young bees; but, whenever I have raised a hive from the bench, if the worms had committed great ravages, I have found young bees under the hive; these bees, I have frequently observed, were half devoured.

After the worms have grown to their full size, they wrap themselves up in a very firm covering; and in about two weeks appear in the form of a moth, or what is commonly called a miller. These moths are of a

light brown colour, and very much resemble those we see on summer evenings flying about our candles. Every evening they may be seen about the bee hives.

Several methods of preventing their destructive ravages have been practised in this neighbourhood. Placing the hive on four blocks, so as to raise it about two or three inches from the bench, has succeeded in a great many cases. This method leaves no harbour for the worms under the hive, and they are destroyed by the bees. The blocks must be removed before winter, or the bees will perish with the cold.

Another method that has been attended with success is to join the hive so closely to the bench, as to leave no harbour for the worms. But, perhaps, a much better method than either of the preceding, is to suspend the hive in the air by means of ropes. The worms have then no harbour. The hives must be placed on a bench before winter.

But, I believe, the most successful method yet discovered, is to raise the hive from the bench early in the morning, two or three times a week, and destroy the worms, which can be very easily done with a small stick. This method has, in many instances, proved completely successful, so that in the fall, when the bees were killed, not a single worm was to be found.

I have sent you some of these worms, which I this day took from a bee hive in this neighbourhood. If you are desirous of any further information respecting them, I will communicate it, if in my power, with great pleasure. Yours, &c.

THOMAS CHAPMAN.

To JOHN R. COXE, M. D.

No. 38.

An Account of a New Method of increasing the charging Capacity of coated Electrical Jars, discovered by John Wingfield, *Esquire, of Shrewsbury;* communicated by Mr.* John Cuthbertson, *with some Experiments by himself on that Subject.†*

IN my treatise entitled *Practical Electricity and Galvanism*, page 103, I have said that breathing into coated electrical jars increased their charging capacity to such an astonishing degree, that their discharge would fuse four times the length of wire more than they could in ordinary circumstances; which I proved by experiments 147 and 156. Since that publication, large electrical batteries are become more general, and the number of jars increased; so that batteries containing thirty, sixty, and even a hundred jars are frequently met with; and, when so numerous, breathing into each jar is very disagreeable; and not only that, but in very dry states of the atmosphere, when most wanted, is even ineffectual, as those jars first breathed into lose that property which was produced in them by breathing, before the last can have obtained it: so that various other means have been tried; such as wetting the inside of the jars, and putting wet sponges into them, or by greasing and oiling the uncoated part in the inside; all of which gave very uncertain results, till John Wingfield, esquire, communicated to me, he had discovered, that pasting of paper on the inside and outside of the jars above the coating, had the effect of preventing the jars from exploding to the out-

* A gentleman who has lately very much distinguished himself, not only in the electrical science, but in all otherr branches of experimental philosophy.

† Tilloch, vol. 36, p. 259.

side coating, and believed that their charging capacity would be increased thereby.

I embraced the first opportunity to try the effect of that discovery with single jars.

Experiment I.—I took a very thick jar (which had been used to show the phenomena of voluntary explosions without breaking) twelve inches high, and the coating nine inches, containing in the whole about one hundred and seventy-one square inches; it was applied to the conductor of a plate electrical machine, and six turns of the plate caused a voluntary explosion to the coating: the state of the atmosphere not being very dry, it required eight and twelve turns to produce a second and a third explosion: a fourth could not be produced; but when cleaned and dried as before, six turns caused a voluntary discharge.

Experiment II.—A slip of paper one inch broad was taken, of sufficient length to fit round the outside of the jar when the two ends were pasted together: this was slipped on to its outside to about one inch from the coating: the uncoated part being rubbed clean and dry, and applied to the machine, eleven turns of the plate produced a voluntary discharge to the outside coating.

Experiment III.—The paper ring was then slipped down to touch the coating, and then applied to the conductor: no voluntary discharge could be produced; and when discharged in the common way, its power did not seem to be increased,—to prove which,

Experiment IV.—The common discharging electrometer (which is always fixed to the basement of my machines) was used, to try to what distance the discharge could be made to pass from the knob of the conductor to the ball of the electrometer; which was found to be one inch and five-eighths.

Experiment V.—A piece of iron wire, one hundredth part of an inch in diameter and one inch in length, was hung to the electrometer, through which a second discharge was made to pass, and the wire was blued.

Experiment VI.—The paper ring was then taken off and breathed into twice; the discharge was then produced at the distance of two inches, and the wire was fused into balls.

Experiment VII.—The jar was then rubbed clean and dry, and a piece of the same sort of wire and the same length was hung to the electrometer in the same manner as before, and it appeared that the greatest charge it could take had not the least effect upon the wire: thus it appears that a paper ring so applied does not increase the charging capacity of jars in the same degree as breathing.

Experiment VIII.—The jar was highly charged, and examined in the dark: the paper ring appeared luminous all round the uppermost edge.

Experiment IX.—The ring was taken off, and pasted on in the inside close to the coating: twenty-three turns caused a voluntary explosion through the ring to the outside coating.

Experiment X.—A second ring three quarters of an inch broad was pasted on close to the other: the same number of turns produced a voluntary explosion, and the paper was torn by the discharge, which was repaired and left to dry.

Experiment XI.—When dry, no voluntary explosion could be obtained.

Experiment XII.—Its greatest power was then tried, and was found to be exactly the same as in Experiment VI, (when it was breathed into): it discharged at two inches distance, and the same length of wire was fuse into balls.

Experiment XIII.—A second jar was taken of a larger size, being thirteen inches high, and its coating seven inches; in the whole it contained about one hundred and ninety square inches: after being rubbed clean and dry, it was applied to the conductor of the machine: twelve turns of the plate produced a voluntary explosion to the outside coating.

Experiment XIV.—A paper ring was put round the uncoated part on the outside at about an inch and a quarter distant from the coating: eleven turns of the plate produced a voluntary explosion to the outside coating: the paper ring was then pushed down to the coating, after which no voluntary explosion to the coating could be obtained; but it discharged itself to the electrometer ball standing at the distance of two inches and three-eighths from the knob of the conductor.

Experiment XV.—The same sort of wire, two inches long, as used in Experiment VI, was hung to the electrometer, and the discharge made it blue with several bendings,—a proof that it had been nearly red hot.

Experiment XVI.—A ring of common writing paper one inch broad was pasted on the inside close to the coating, and when dry no voluntary explosion to the coating could be obtained; but it discharged itself to the electrometer ball standing at the distance of two inches and five-eighths and the wire was fused into balls.

Experiment XVII.—The paper rings were now taken off, and the uncoated part made clean and dry: nineteen turns produced a discharge to the electrometer ball at the same distance, and the same length of wire was slightly blued.

Experiment XVIII.—The jar was then breathed into, and a discharge was produced at the same distance, but the wire was not fused.

Experiment XIX.—The same jar was breathed into a second time, and a discharge was caused at the same distance, and the wire was fused into balls exactly the same as when the paper rings were on.

Experiment XX.—A third jar nine inches high and four inches diameter, the whole containing about sixty-four square inches, when rubbed clean and dry, two turns of the plate caused a voluntary discharge to the outside coating.

Experiment XXI.—A paper ring was pasted on both sides close to the coating, and one inch from the top, after which no voluntary explosion could be obtained, but the electric fluid was seen to run over the brim of the glass to the outside coating as quick as the machine could give it: the discharging distance was seven-eighths of an inch: it had not power sufficient to make any impression on one inch of wire.

Experiment XXII.—The paper rings were then cut narrower at different times, and tried, which increased the discharging distance, when there remained only one quarter of an inch which seemed to be the most favourable above the coating: the discharging distance was one inch and three eighths, and the wire was fused, and dispersed in balls.

Experiment XXIII.—The paper rings were taken off, and the jar carefully breathed into: six turns of the plate caused a discharge to the electrometer standing at the distance of one inch and a quarter, and one inch of wire was fused, and dispersed in balls, equal with the last experiment.

The above experiments are sufficient to prove that paper rings pasted on to electrical jars in the manner explained, do hinder voluntary explosions, and increase the charging capacity of coated jars, in the same degree as breathing into them.

Further experiments and observations, setting forth the advantages that electricians are likely to obtain from the above discovery, will be the subject of a future paper.

No. 39.

Description of the Optigraph (invented by the late Mr. Ramsden) *as improved and made by Mr.* Thomas Jones.*

(With an engraving.)

THE methods used to facilitate the practice of drawing in perspective, as well for those versed in this polite art, as for those who have made less proficiency, have been various and numerous. Though some have supposed that the warmth of imagination and luxuriance of fancy, which impel the mind to the cultivation of the fine arts, are not to be confined to mechanical modes, yet upon observation and inquiry they will find that the most able and accomplished artists are often obliged to have recourse to some rules, and to use some mechanical modes to guide and correct their pencil: but so tedious is the operation, and great the difficulty, of representing objects in true perspective, that they trust mostly to their eye and experience for success. The result of such a mode of proceeding may be determined by portraits drawn by the best artists, and the different judgments formed concerning them. It has been well observed, that there is no artist who will be hardy enough to say that he can delineate by the eye the same object twice with exactness, and preserve a just and similar proportion of parts in each. In one of the figures we

* Tilloch, vol. 28, p. 66.

shall find some of the parts larger than in the other; both cannot be right: yet supposing them perfectly the same, neither may be conformable to nature. In addition to this, many situations of an object occur, which no eye, however habituated, can represent with accuracy.

On this account many attempts and various instruments have been made for the purpose of giving the outline of an object with accuracy.

The late most ingenious Mr. Ramsden, so well known for his inventions and improvements in various instruments, considered the present subject an object worthy of his attention, and invented the instrument I am about to describe, which is so simple and easy in its operation, that a person not possessed of the least knowledge of drawing, may, with less than three minutes' instruction, be perfectly able to take a perspective view of landscape, building, machinery, or, in fact, an object of any description presented to his eye, with the utmost correctness.

Mr. Ramsden left this instrument without the means of enabling the operator to enlarge or diminish his drawing; an inconvenience which I have obviated, while at the same time I have added some other trifling improvements. This instrument is certainly superior to any hitherto constructed for the same purpose; for in this the operator views the object through a telescope, which enables him to delineate minute objects with great exactness and ease, which are often too far from the eye to be seen sufficiently well to be delineated correctly.

Fig. 3, (plate 6,) is a perspective view of the optigraph. A represents the drawing board, on the outside frame of which is fixed the pillar of the instrument, B, by a clamp *a*. C is a tube, (sliding in the pillar,) on the top of which is fixed, by means of a screw *c*, the frame

D; at the end of this frame is a plain mirror E, beneath which is suspended, by a universal joint, the telescope F, of which G is the eye-tube. H are sliding tubes, capable of being shortened or lengthened in the same proportion as the inside speculum *c*, (fig. 4,) which is fixed to any place by the clamp screw P. The pencil L, of which *h* is the handle, slides perfectly easy, without shake, in the tubes H: the pencil is so contrived as to have all the freedom of a pen when held in the hand for use.

Fig. 4, represents a section of the telescope, being the principal part of the invention. The rays from an object entering the plain mirror *a*, are reflected into the telescope, passing through the object-glass *b*, and entering the speculum *c*, are reflected through the eye-glass *d*, to the eye at *e*: *f* is a piece of parallel glass, with a small dot on its centre, exactly in the focus of the eye-glass *d*.

Mode of Using the Optigraph.

Fix the drawing board to the table (by a clamp which is packed in the box) so that the surface of the mirror E is nearly parallel to the object; then take hold of the handle *h*, and hold the pencil on that part of the paper where you would wish the centre of your drawing, or any part thereof, to be. Then place your eye at the eye-tube G, and with your left hand alter the inclination of the mirror E until the small dot, described at *f*, in fig. 4, is on some particular part of the object that you wish to begin with, adjusting the telescope to distinct vision by the milled head P. Then by moving your hand (having the pencil) you pass the dot seen in the field of the telescope over the object, the pencil marking it at the same time on the paper.

Fig. 1.

Perspective Instrument

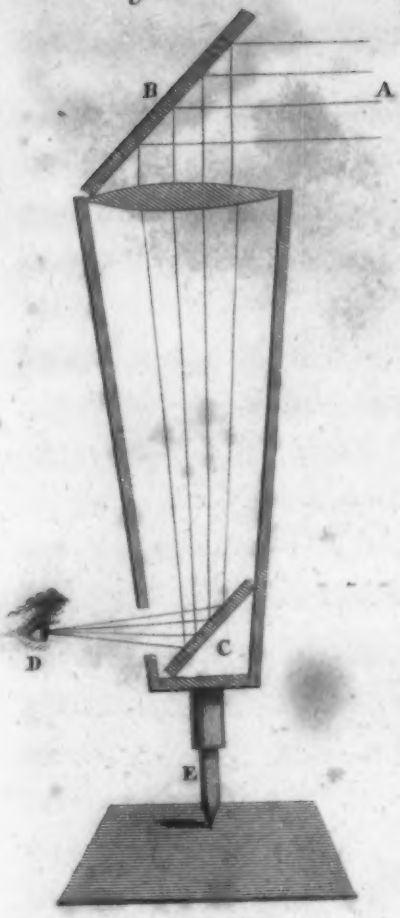


Fig. 3.

Jones Optigraph

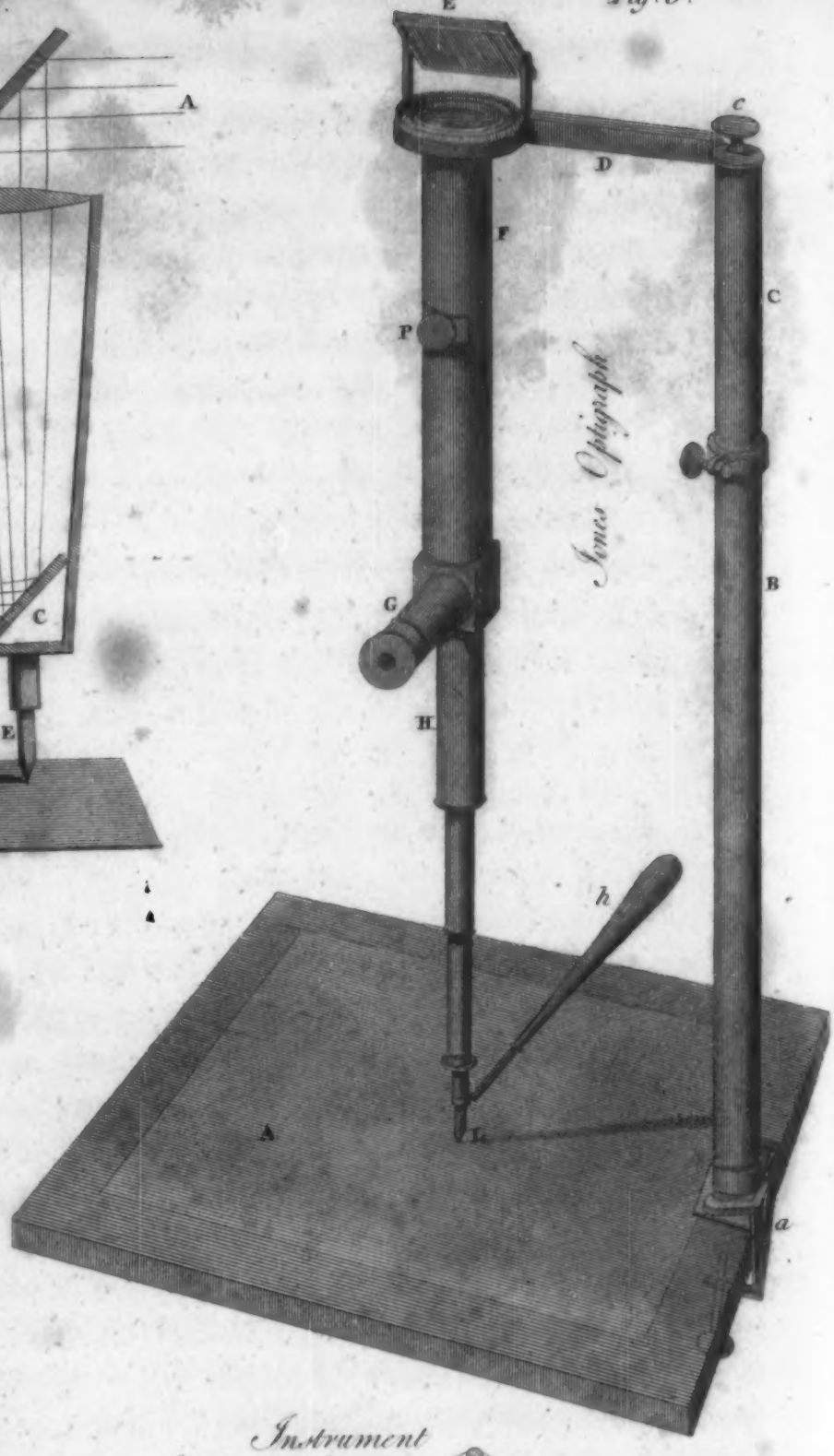
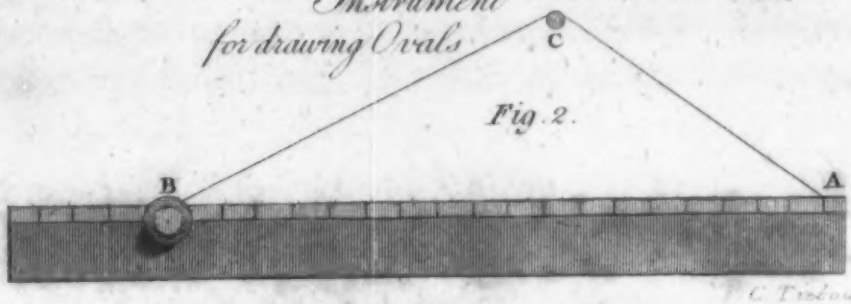


Fig. 4.

Instrument for drawing Ovals

Fig. 2.



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To make your drawing larger, pull out the tube of the pillar C, fig. 3, and fix it with the screw *e*; then pull out the sliding tubes H, till the pencil is within half an inch of the paper, (in the middle of the board,) and proceed as before.

To make the drawing smaller, shorten the tubes C and H by sliding them in, and proceed as before.

No. 40.

Description of an Instrument for drawing in true Perspective from Nature, and of another of considerable Simplicity and Cheapness for delineating Ovals. By R. B.*

[With an engraving.]

To Mr. Nicholson.

SIR—As I observe that you are willing, in your capacity of Journalist, to lay before the public any sketch or outline of invention that may promise to be useful, whether in its ultimate state of improvement or not, I am encouraged now and then to send my thoughts, queries, observations, or news, as they may occur. The following instruments are offered to your notice, in hopes they may appear in your excellent collection.

Fig. 1, *Plate* 6, is a sketch of an instrument for perspective, made some years ago by Dolland, and of which I know not the inventor. A telescope or camera is suspended vertically on a frame by an universal joint or jimbals. Horizontal rays A, are directed down the tube by a plane mirror B, and are again rendered horizontal,

* Nicholson, vol. 9, p. 122.

and turned to the eye through a side hole in the tube, by another mirror C. At the lower end is a pencil E sliding in a well-fitted socket, and pressed gently downwards by a weight or spring; or still better, by the hand only. The result or use is, that while the images are in succession brought into apparent contact with a point in the field of view, the pencil may be employed in tracing them in true perspective upon the table beneath.*

Fig. 2, represents a simple rule and string for drawing ovals on paper. A C B is a silken thread, fixed at A, and capable of being lengthened, shortened, and fixed by a screw B at the other end. This screw B can be placed, by a longitudinal groove in the ruler, at any distance from A, and can be made to pinch the thread upon any one of the divisions of the rule. At C is a pencil to be moved in the bend of the thread. It must be held upright, and it would be easy to contrive means of keeping it so; but it does not seem an object of sufficient necessity to add to the price of the instrument.

In the use, set A at one focus of the intended oval and B at the other. Allow the string to extend till the pencil marks the extremity of the conjugate diameter. Draw the semi-oval by moving the pencil along in the stretched thread: Then reverse the points A and B, placing them respectively on the foci occupied before by each other. Draw the other semi-oval, which completes the figure. I am, &c.

R. B.

* There is an omission of the grey or rough glass, if the drawing be meant for a camera; or of the eye-piece, if it be a telescope. The first focal convergence must be made in these, and not at the eye.—NICHOLSON.

No. 41.

On Chemical Printing, and particularly on the Progress of this Art in Germany. By Mr. Marcel de Serres.*

Vienna, October 17, 1809.

THE art of printing from stone, known in Germany by the name of *chemische druckerey*, "chemical printing," originated in Germany; whence it spread first into England, then into Italy, and lately into France. It was invented by Aloys Senefelter, who was born at Prague, in Bohemia. Nine years ago he obtained of the king, formerly elector of Bavaria, an exclusive patent for its use for thirteen years; but he afterward sold the right to his brothers. Some time after Senefelter sold his right also to Mr. Andrew von Offenbach, who at present exercises the art in England. In 1802 he came to Vienna, to solicit a patent, and in 1803 he obtained one from the emperor of Austria for ten years. Changing his mind, he parted with this patent to Messrs. Steiner and Krasnitzki, returned to Bavaria, and set up a chemical printing office at Munich in partnership with some other persons. Messrs. Steiner and Krasnitzki still continue the business at Vienna, under the patronage of the counsellor of regency Startl von Luchsenstein, who is a zealous promoter of every useful undertaking.

At the chemical printing office at Munich the art has attained the greatest perfection, that of Stutgard apparently being of much less importance. Mr. Chauvron was the first who obtained a patent in France for printing or engraving on stone, and Mr. Guyot Desmarets did not attempt it till after him.

* Nicholson, vol. 26, p. 208. Abridged from the *Annales de Chimie*, vol 72, p. 202.

The processes employed are simple, but as only a brief account of them has yet been given, it may be of use at least to make known those followed in Germany.

In the chemical printing office at Vienna three different methods are employed; but that termed in relief is most frequently used. This is the general mode of printing music.

The second method is the sunk. This is preferred for prints.

The third method is the flat, or neither raised nor sunk. This is useful for imitating drawings, particularly where the impression is intended to resemble crayons.

For printing or engraving in this method a block of marble is employed, or any other calcareous stone, that is easily corroded, and will take a good polish. It should be two inches or two inches and a half thick, and of a size proportioned to the purpose for which it is intended. A close texture is considered as advangeous.

When the stone is well polished and dry, the first step is to trace the drawing, notes, or letters, to be printed, with a pencil. The design is not very conspicuous, but it is rendered so by passing over the strokes of the pencil a particular ink, of which a great secret is made. This ink is made of a solution of lac in potash, which is coloured with the soot from burning wax. This appears to be the most suitable black for the purpose. When the design has been gone over with this ink, it is left to dry, which commonly takes about two hours; but this depends much on the temperature and dryness of the air.

After the ink is dry, nitric acid, more or less diluted according to the degree of relief desired, is poured on the

stone; and corrodes every part of it, except where defended by the resinous ink.

The block being washed with water, an ink similar to that commonly used for printing is distributed over it by means of printers' balls, a sheet of paper disposed on a frame is laid on it, and this is pressed down by means of a copper roller, or copper press. The beauty of the impression will necessarily depend on that of the design. These copper presses are very ingeniously constructed in Germany, and easily worked. Their weight is proportional to the method of printing used.

When the desired number of impressions is taken off, and the work is not intended to be used any more, the stone is polished anew; and thus it may be made to serve for thirty or forty different works.

The sunk, or chalk method differs from that termed in relief only in having the stone much more corroded by the nitric acid. This is chiefly employed for prints, and has the advantage of remedying that uniformity of tint, which is common to prints from the chemical press. It is natural, that the higher parts should take less of the ink, and the lower parts more, so that the impression has less monotony; a defect hitherto seemingly inherent in this mode of printing. For this method too the rollers must be stronger and heavier.

As this method is more expensive, it is given up: yet for prints, where some degree of effect is required, and more clearness, it is to be preferred. In this method nearly pure nitric acid is employed. Indeed when the art was first invented, pure nitric acid was always used; but soon after, to save expense, it was diluted with water; and since that it has been employed more or less diluted, according to the effect wished to be produced on the stone.

For the method in relief, as it is called, nitric acid with half water is used.

In the flat method less nitric acid is used. It is not to be supposed, that the surface is quite plain in this way; but the lines are very little raised, so that they can scarcely be perceived to stand above the ground but by the finger.

The works executed in stone are; 1, imitations of wood cuts: 2, imitations of engravings in the dotted manner: 3, drawings: 4, music: 5, all kinds of writing: 6, maps: 7, copperplates.

The advantages of this method are, that it has a peculiar character, which cannot be represented by any other mode, while it gives a tolerable imitation of other methods; and still more the celerity, with which it can be executed. A subject, that an artist could not finish in five or six days on copper, may be engraved on stone in one or two. While a copperplate printer is taking off six or seven hundred impressions, two thousand may be printed in this way. A copperplate will scarcely give a thousand good impressions, while in this way several thousands may be taken off, and the last be as perfect as the first. Thirty thousand have been taken off one design at Vienna, and the last was as beautiful as the first. This is intended to be carried still farther, for the purpose of printing bank notes. The most expert music engraver can scarcely execute four pages of music on pewter in a day, but the engraver on stone can finish twice as much in that time.

To enter into the particulars would take up too much room, but experience has shown, that this mode saves two thirds of the expense of engraving on copper or pewter.

After having mentioned the advantages of printing from stone, it is just to point out its disadvantages.

These are, the difficulty of giving that diversity of tone, which is admired in engravings. Thus for instance, the finest prints that this art has yet produced are unquestionably those, that have been executed at Munich* from those celebrated drawings, which from a whim, in which painters are apt enough to indulge, Albert Durer made in a prayer book. These prints are executed with spirit, and the stroke is frequently clean; but it is uniform, so that the print is somewhat gray and monotonous. The difference is still better perceived, on comparing these prints with those etched by the different masters themselves.

The same inconvenience is found in music, the uniformity that prevails rendering the music less easy to read.

We must not too hastily conclude however, that this new art is not important: we should endeavour to find means of remedying the inconveniences, that appear to arise from the mode employed. If such means be discovered, which we may hope from experience showing, that the manner of applying the acid and of drawing upon the stone are the points most important to improve, this mode of printing will combine a saving both of time and expense. The great number of copies too, that may be taken off, is not one of its least advantages.

It remains now to notice the differences, that appear to exist in the chemical printing offices of different cities. At Milan a little nitric acid is poured over the stone, as at Vienna: but it is said, that they cannot take off above five hundred impressions. This must be owing to the

* Albrecht Durers Christlich mythologische Handzeichnungen. Strixner, Munich, 1808. Different inks have been used for prints, as black, red, violet, and green.

nature of the stone employed, which is procured from Verona.

Chauvron, the first who set up a chemical printing office at Paris, after having traced the design on stone with a resinous ink, merely wets it with water, and wipes off the water from the design. Printing ink is then applied by beating in the common way with balls; and, as this does not adhere to the wet stone, the resinous strokes only produce an impression. Chauvron is said to have printed a great deal of music in this way.

We must observe, that, where nitric acid is not used, the prints will never be so fine, and so many impressions cannot be taken off. The use of nitric acid therefore cannot be too strongly recommended.

No. 42.

Account of a Composition for preserving Weather-boarding, &c. By William Pattenson, *Esquire.**

I HAVE often thought something much wanted for preserving weather-boarding, &c. from the injuries of the weather. Tar and oxer, and other mixtures recommended for the purpose, I have tried, but do not find they answer. I therefore made many experiments to discover a composition better adapted to the purpose, and think I have found one which answers my expectation: it is impenetrable to water, is not injured by the action of the weather, or heat of the sun, which hardens it, and consequently increases its durability; it is much cheaper than paint, and more lasting.

* Repertory of Arts, vol. 8, p. 126. From the *Transactions of the Society for the Encouragement of Arts, &c.*

The composition is as follows: three parts of air-slaked lime, two of wood-ashes, and one of fine sand, or sea-coal ashes; sift these through a fine sieve, and add as much linseed-oil as will bring the mixture to a consistence for working with a painter's brush. Great care must be taken to mix it perfectly: I believe grinding it as paint would be an improvement. Two coats are necessary; the first rather thin, the second as thick as can conveniently be worked. From the nature of this composition, there is no doubt but it is very durable; as it certainly will improve in hardness by time, and is much superior for the purpose to any thing I know of.

NO. 43.

*Instructions respecting the Purification of Saltpetre, drawn up by Order of the Committee of Public Safety of Paris; by whose Order also this Process is adopted in all the Laboratories of France.**

THE crude saltpetre is first to be bruised with wooden beaters, that the water, with which it is afterwards to be washed may more easily act upon every part of it.

The saltpetre, thus bruised, is then to be carried to proper tubs or vats, in each of which five or six hundred pounds may be put.

Water is to be poured upon the saltpetre, in the proportion of twenty parts to a hundred, and the mixture is to be well stirred.

It is then to be left to macerate or soak, till the liquor will dissolve no more. Six or seven hours are sufficient for this first operation; the liquor then indicates from twenty five to thirty-five degrees, by the *pese-liqueur*.

* Repertory of Arts, vol. 8, p. 199. From the *Annales de Chimie*.

This first washing is then to be drained off, and fresh water, in the proportion of ten parts to a hundred, is to be poured on the saltpetre.

The mixture is to be stirred, and left to soak for the space of an hour: the water is then to be again drained off.

Fresh water is to be once more poured on the saltpetre, in the proportion of five parts to a hundred, which water, after stirring, is to be immediately drained off.

This drained saltpetre is then to be put into a cauldron, containing fifty parts of boiling water to a hundred. When the saltpetre is dissolved, the solution ought to indicate from sixty-six to sixty-eight degrees, by the *pese-liqueur*.

The solution is then to be carried to a crystalizing vessel, in which, by cooling, about two thirds of the saltpetre made use of will be precipitated; the precipitation begins in about half an hour, and finishes from four to six hours afterwards. But, as it is of importance that the saltpetre should be obtained in the form of thin needles, because in this form it is more easily dried, it is necessary that the liquor in the crystalizing vessel should be stirred the whole time the precipitation is forming. The stirring is performed by means of a kind of rake, which gives a slight motion to the mass of liquor, and causes the crystals to be precipitated in the form of thin needles.

As the precipitation takes place, the crystals are to be brought to the border of the crystalizing vessel; to be taken up with a skimmer, and put to drain in baskets placed, for that purpose, upon frames, in such a manner that the water which runs from the crystals, may fall again into the crystalizing vessel; or it may be received in basons placed under the baskets.

The saltpetre is then to be thrown into wooden boxes, formed like the hopper of a mill, and having a double bottom. The upper bottom is supported, by means of pieces of wood, about two inches above the lower one, and is pierced full of small holes; through these holes the liquor drains off, and finally passes, through a hole made in the lower bottom, into a reservoir beneath. In these boxes the saltpetre is to be washed, with five parts of water to a hundred; this water may be used for dissolving the saltpetre, in future operations.

The saltpetre, after being well drained, and exposed to the air for some hours, upon proper tables for drying it, may be afterwards made use of for making gunpowder.

But, when it is intended to make use of the saltpetre for making gunpowder according to the process followed since the revolution, it must be much more highly dried. This may be accomplished by placing it in a stove; or, what is more simple, by heating it in a shallow cauldron. For this purpose, a layer, five or six inches in thickness, is to be put in the cauldron, which is to be heated to 40 or 50 degrees of Reaumur's thermometer.

The saltpetre is to be stirred for two or three hours, and to be so much dried, that, when strongly pressed in the hand, it does not acquire any consistence, nor retain any form, but appears like fine dry sand.

This degree of dryness is not necessary, when the gunpowder is to be made by beating with pestles.

It is then evident that, according to the method of purification we have prescribed, there are two kinds of liquor to consider; first, the water from the various washings of the crude saltpetre; secondly, the water from the crystalizing vessels.

The washing of the crude salpetre is repeated three times, as we have already mentioned.

In these three operations, thirty-five parts of water to a hundred of saltpetre, according to the quantity of it meant to be purified, are employed in washing.

These washings are founded upon the principle which establishes, that cold water dissolves the muriate of soda, (sea-salt,) the earthy nitrates and muriates, and the colouring principle, while it scarcely acts upon the nitrate of potash, (pure saltpetre.)

The water from these three washings, therefore, contains the muriate of soda, the earthy salts, the colouring principle, and a small portion of nitrate of potash, the quantity of which is in proportion to the muriate of soda, which determines its solution.

The water from the crystalizing vessels contains that portion of muriate of soda, and of earthy salts, which were not dissolved by the washings, also a more considerable quantity of nitrate of potash than was contained in the water of the washings.

The water which is employed at the end of the process, to wash and whiten the crystals placed in the wooden box, holds in solution only a small quantity of nitrate of potash.

These liquors therefore are of a very different nature.

The waters proceeding from the washings, may properly be called mother-waters; they ought to be collected together in basons, and treated with potash, according to the usual method. At the refinery called *de l'Unité*, they are evaporated to sixty-six degrees, and the muriate of soda is taken away, as fast as it is deposited; this solution is saturated with potash, in the proportion of two or three to the hundred; it is then suffered to settle, and the liquor is afterwards decanted into crystalizing vessels, in which are thrown twenty parts of water to a hundred, that all the muriate of soda may be kept in solution.

The liquor which remains above the crystals, produced by this treatment of the mother-waters, may be mixed with the water of the first crystalization. The muriate of soda may be separated from this liquor by simple evaporation; and the nitrate of potash which it holds in solution may be obtained from it by cooling.

The small quantity of water made use of to whiten the refined saltpetre, contains only nitrate of potash; it may therefore be made use of for dissolving the saltpetre in the cauldrons.

From the foregoing account it is evident, that a laboratory destined for the purification of saltpetre, according to the process here described, ought to be provided with the following articles.

1. Wooden beaters for bruising the crude saltpetre.
2. Tubs or vats, in which the saltpetre is to be washed.
3. A cauldron, in which the solution is to be made.
4. A crystalizing vessel, of copper, or of lead, in which the liquor is to be cooled, and the saltpetre crystalized.
5. Baskets for draining the crystals.
6. A wooden box, in which the crystals are to be more thoroughly drained, and the saltpetre washed for the last time.
7. Scales for weighing the saltpetre.
8. Thermometers and *pese-liqueurs*, to determine the degree of heat, and that of consistence.
9. Rakes to stir the liquor in the crystalizing vessel.
10. Skimmers to take off the crystals and put them into the baskets.
11. Syphons or cranes to empty the cauldrons.

The number of these implements, and their dimensions, must necessarily vary, according to the quantity of saltpetre proposed to be purified.

Supposing it is wished to purify ten thousand pounds of crude saltpetre per day; the number of men and utensils, necessary for that purpose, may be determined according to the following calculation.

On Weighing and Bruising the Crude Saltpetre.

A piece of ground must be set apart, as near the magazine as possible, for the purpose of beating or bruising the crude saltpetre.

This ground must be covered with broad smooth stones, or with very thick boards.

For bruising the saltpetre, wooden beaters may be made use of, similar to those which are used for beating mortar.

Two men are sufficient for carrying the saltpetre to the magazine, for weighing it, and bruising it.

On Washing the Saltpetre.

As the three washings take up the space of two days,* and as each of the tubs or vats will contain only five or six hundred pounds of saltpetre, twenty of them will be necessary for the purification of ten thousand pounds.

These tubs are to be two feet and a half in height, and the same in breadth.

They must be constructed with the greatest care, that the water used in washing the saltpetre may not escape through them.

They should be firmly fixed upon a plane, slightly inclined, of such a nature that the water from the saltpetre cannot soak into it. This plane should be terminated by a gutter, to receive the water from the saltpetre, and to

* This neither agrees with the time stated, in the beginning of the paper, as necessary for the three washings, nor with what has just now been said, that ten thousand pounds may be thus refined per day. We notice this, lest our readers should think our translation erroneous.

conduct it into a reservoir placed at the end of the row of tubs.

These twenty tubs may be disposed in two parallel lines. The planes upon which they are fixed may be inclined towards each other; so that their union may form the gutter or channel which is to conduct into the common reservoir the water that runs off.

These tubs are to have an aperture at the distance of two fingers' breadth from the bottom; which aperture (besides the stopper which closes it) must have a grated or perforated cover.

Four men may be allotted to the washing of the saltpetre: they should also have the charge of carrying the saltpetre from the magazine to the tubs, and from the tubs to the cauldron.

It is hardly necessary to mention, that the tubs should be separate from each other, and disposed in such a manner that they may be easily served.

On the Cauldron.

A conical cauldron, five feet broad, and four feet deep, will supply three operations in the day; and consequently will suffice for the purification of fifteen thousand pounds of saltpetre.

One man is sufficient for the service of the cauldron.

On the Vessel for Crystalization.

The crystalizing vessel should be made of lead, or of copper, and should be placed as near the cauldron as possible.

It should be fifteen inches in depth, ten feet in length, and eight in breadth.

It should be fixed upon very solid ground, in such a manner that every point of the bottom may be supported. The stone or brick work on which it is placed, should be

raised twelve inches above the ground; by this means, the brink of the crystalizing vessel will be twenty-seven inches above the ground, which will render the service of it more easy and convenient.

It appeared to us advantageous, to give the bottom of the crystalizing vessel an inclination of four inches (in the longitudinal direction only) from the sides to the centre.

The solutions from the cauldron may be emptied several times successively into the vessels after having taken away the deposition of crystals arising from each solution.

Four men seem necessary for the service of the crystalizing vessel. They must keep the liquor constantly stirred, by moving the rakes therein; they must continually bring towards the edges of the vessel the crystals which are formed; they must take them out with a skimmer, and carry them to the baskets which are to receive them, and in which they are to drain.

The same men may put the saltpetre into the wooden boxes in which the draining is completed, and may afterwards carry it into the magazine for purified saltpetre.

For want of a large vessel for crystalization, a shallow cauldron may be made use of.

On Drying the Saltpetre.

To render the saltpetre fit to be made use of in the preparation of gunpowder, as soon as it is purified, it may be dried by either of the two following processes. First, by exposing it to the open air, or to the sun, during some hours, upon such tables as are used for drying gunpowder. Secondly, by putting it into a shallow cauldron, and keeping it, for the space of two hours, in a heat of from 40 to 50 degrees.

In either case, the saltpetre must be incessantly stirred and shaken, that it may dry quickly and equally.

General Remarks on the foregoing Process.

A pretty long experience has shown us, that the process here described is the most simple, and the most economical.

But, to spare others the trouble of trying such means of improving this process as have occupied our attention, but which we thought it right to reject, we shall submit to them the following reflections.

1. It has been tried to dissolve the crude saltpetre; to crystalize it; and afterwards to wash it, in order to separate the sea-salt from it.

This process at first sight appears more advantageous, because it is then unnecessary to bruise the saltpetre, but it is attended with great inconveniences. First, the crude saltpetre, dissolved in fifty parts of water to a hundred, and poured into the crystalizing vessel, does not deposit the same quantity of saltpetre as when it is washed before it is dissolved. This difference takes place, because the sea-salt, which exists in the crude saltpetre, facilitates the dissolution of the nitrate of potash; and consequently, the water in the crystalizing vessel must necessarily hold in solution a greater quantity of nitrate of potash, when the crude saltpetre is dissolved, than when it is previously washed in cold water, and thereby deprived of the sea-salt it contained. Secondly, the washing of the saltpetre, when done after its dissolution and crystalization, requires forty or fifty parts of water to a hundred, instead of thirty-five.

2. It has been tried to dissolve the saltpetre in twenty or twenty-five parts of water to a hundred; to take away the muriate of soda, as fast as it is precipitated by the boiling of the liquor; to dilute this solution with thirty

parts of fresh water to a hundred, and then to carry it to the crystalizing vessel. It was supposed, that by this means, the washings with cold water might be omitted, or considerably diminished. But, a continued boiling, kept up for four or five hours, in order to separate the sea-salt, is attended with a great waste of time, of fuel, and of saltpetre; and the washings are still indispensably necessary, both to take away the colouring matter, and to extract the last portions of sea-salt.

3. It may be supposed, that it would perhaps be possible to diminish the quantity of water used in washing; but we must observe, that it is to be feared, that when the saltpetre contains a great quantity of sea-salt, the purification of it would not be complete, if a less quantity of water were made use of than that we have prescribed.

4. One might perhaps be tempted to diminish the quantity of water made use of in the solution; but we are convinced, by repeated experiments, that the proportion we have pointed out is the most proper: if it is augmented, the saltpetre remains dissolved in the liquor; if it is decreased, it congeals or precipitates itself in a mass. We found, by observation, that the degree of saturation, most proper for our operations, was between the sixty-sixth and sixty-eighth degree of the *pese-liqueur*.

5. It might also be thought, that it would be more simple, and more economical, to treat the solutions of crude saltpetre with potash; but it is to be feared, that by so doing, a part of this alkali might have the effect of decomposing the muriate of soda, and converting it into muriate of potash; and it must be observed, that the last-mentioned salt is by no means proper for decomposing earthy nitrates, whatever some able chemists may have said of it.

It therefore appears more proper, not to treat the mother-waters, nor to make any use of potash, till all the sea-salt has been separated by evaporation.

No. 44.

Some Account of a Journey to the Frozen Sea, and of the Discovery of the Remains of a Mammoth. By M. Michael Adams. *Translated from the French**

I SHOULD have reason to reproach myself were I to delay any longer the publication of a discovery in Zoology, which is so much the more interesting to be detailed, as it once more presents to our view a species of animal, the existence of which has been a subject of dispute among the most celebrated naturalists.

I was informed at Jakoutsk by M. Popoff, who is at the head of the company of merchants of that town, that they had discovered upon the shores of the Frozen Sea, near the mouth of the river Lena, an animal of an extraordinary size: the flesh, skin, and hair, were in good preservation, and it was supposed that the fossile production, known by the name of mammoth horns, must have belonged to some animal of this kind.

Mr. Popoff had, at the same time, the goodness to communicate the drawing and description of this animal; I thought proper to send both to the President of the Petersburgh Academy. The intelligence of this interesting discovery determined me to hasten my intended journey to the banks of the Lena as far as the Frozen Sea, and I was anxious to save these precious remains, which might perhaps otherwise be lost. My stay at Jakoutsk, therefore, only lasted a few days. I set out on the 7th of June 1806, provided with some indispensable letters of recommendation, some of which were addressed to the servants of the government, and others to merchants, from whom I hoped to derive some advantages. On the

* Tilloch vol. 29. p. 141.

16th of June I arrived in the small town of Schigarsk, and towards the end of the same month I reached Kumak-Surka: from this place I made an excursion, the express object of which was to discover the mammoth. And I shall now give a sketch of my journey.

The contrary winds, which lasted during the whole summer, retarded my departure from Kumak-Surka; this place was then inhabited by forty or fifty Toungouse families of the Batouline race. Fishing was their ordinary occupation, and the extreme activity of these people filled me with admiration: the women, old men, and even children, laboured with indefatigable assiduity in laying up provisions for winter. The strongest went a-fishing, the less robust were occupied in cleaning and drying the fish. The whole shores were covered with scaffolding, and the cabins so filled with fish that we could scarcely enter them. An innocent gaiety reigned in every countenance, and all exhibited the utmost activity. The fishermen sang while casting their nets, and others were dancing the Charya, which is a dance peculiar to the country. I cannot sufficiently express the emotions of joy which I felt at the sight of these pleasing scenes.

I was convinced, while upon the spot, that the inhabitants of the North enjoy happiness even in the midst of the frozen regions.

But what astonished me still more, was the picturesque view of the opposite side of the Lena. This river, which is one of the largest in Siberia, majestically rolls its waters through the mountainous chain of Verschéjansk: it is here, near its mouth, entirely devoid of islands, and much narrower, deeper, and more rapid than in any place of its course. The mountains here appear in a great variety of forms; they are of a brilliant whiteness, and of a savage and horrid aspect; sometimes they re-

present immense columns which rise into the clouds, sometimes they resemble the ruins of ancient forts, and as if they were parts detached from the mutilated remains of grotesque and gigantic figures.

Further off, the horizon is terminated by a chain of high mountains, where eternal snow and ice dart back the rays of the sun.

These landscapes are of exquisite beauty; an expert draughtsman would look in vain for similar views in any other place of Siberia; and I am not astonished that the picturesque situation of Kumak-Surka should become the object of a national song, known solely on the shores of the Frozen Sea. I reserve the communication of this curious article until I publish the detailed account of my journey.

The course of the winds having at last changed, I thought of pursuing my route, and I had my rein-deer brought across the river. Next day at day-break, I set out accompanied by a Toungouse chief, Ossip Shoumachoff, and by Bellkoff, a merchant of Schigansk, and attended by my huntsman, three Cossacs, and ten Toungouses.

The Toungouse chief was the first person who discovered the mammoth, and he was proprietor of the territory through which our route lay. Bellkoff the merchant had spent nearly his whole life on the shores of the Frozen Sea. His zeal, and the details he procured me, have the strongest claims to my gratitude: I am even indebted to him for the preservation of my life at a moment of imminent danger.

At first I found great difficulty in sitting upon a rein-deer; for, the saddle being attached by a girth of leather only, it was very insecure, and often occasioned me very disagreeable falls. Besides, my position was very in-

convenient for want of stirrups, which are never used among the Toungouses.

On our route we traversed high and rugged mountains, valleys which followed the course of small rivulets, and parched and savage plains, where not a shrub was to be seen. After two days travelling, we at last approached the shores of the Frozen Sea. This place is called by the Toungouses Angardam, or terra firma. In order to attain the mammoth, it was necessary to traverse another isthmus, called Bykoffskoy-Mys or Tumut. This isthmus, which projects into a spacious gulf, is to the right of the mouth of the Lena, and extends, as I was informed, from South-east to North-east for about thirty or thirty-five wersts.* Its name is probably derived from two points in the form of horns, which are at the north extremity of this promontory. The point upon the left hand, which the Russians call by way of eminence Bykoffskoy-Mys, on account of its greater extent, forms three vast gulfs, where we find some settlements of Jakouts: the opposite point, called Manstach on account of the great quantity of floating wood found upon its shores, is one half smaller; its shore is lower, and this district is completely inhabited. The distance from the one point to the other is estimated at four leagues and a half, or forty-five wersts. Small hills form the higher part of the peninsula of Tumut; the remainder is occupied by lakes, and all the low grounds are marshy.

The principle lakes are: 1st, Chastirkoöl, which means the lake of geese; 2d, Kourilakoöl; 3d, Beulgeuniachtachkoöl, the lake of hillocks; 4th, Omoulachkoöl; 5th, Mougourdachkoöl, where a particular kind of salmon is found called tchir; and 6th, Bachofkoöl. The lake No. 4 is the largest, and No. 5 is the deepest of

* Ten wersts are equal to six English geographical miles.

all. The lake No. 6 derives its name from two famous adventurers, Bachoff and Schalauroun, who spent a whole winter on its banks. We still see the ruins of a cabin in which they resided. The history of their unfortunate end is told by M. Sauer in his Journal of Billings's expedition.

The isthmus we have mentioned is so narrow at some places that the sea may be seen on both sides. The rein-deer perform a periodical transmigration every year, during which they abandon these places, in order to proceed by the Frozen Sea towards Borschaya and Uitjansk, and for this purpose they collect in large troops about autumn. In order to hunt these animals with greater prospect of success, the Toungouses have divided the peninsula into cantons, separated by palings. They frighten the deer by loud cries, which they utter all at once, by letting dogs loose at them, and by fans which they attach to the palings, and which are agitated by the wind. The terrified rein-deer throw themselves into the water in order to reach some neighbouring island, where they are pursued and killed by the hunters.

On the third day of our journey we pitched our tents a few hundred pases from the mammoth, upon a hillock called Kembisagashaeta, which signifies the stone with the broad side.

Schoumachoff related to me the history of the discovery of the mammoth in nearly the following terms:—

"The Toungouses, who are a wandering people, seldom remain long in one place. Those who live in the forests often spend ten years and more in traversing the vast regions among the mountains: during this period they never visit their homes. Each family lives in an isolated state from the rest: the chief takes care of them, and

knows no other society. If, after several years absence, two friends meet by chance, they then mutually communicate their adventures, the various success of their hunting, and the quantity of peltry they have acquired. After having spent some days together, and consumed the little provisions they have, they separate cheerfully, charge each other with compliments for their respective friends, and leave it to chance to bring them together again. Such is the way of life of these innocent children of Nature. The Toungouses who inhabit the coast differ from the rest, in having more regularly built houses, and in assembling at certain seasons for fishing and hunting. In winter they inhabit cabins, built close to each other, so as to form small villages.

"It is to one of these annual excursions of the Toungouses that we are indebted for the discovery of the mammoth. Towards the end of August, when the fishing in the Lena is over, Schoumachoff is in the habit of going along with his brothers to the peninsula of Tumut, where they employ themselves in hunting, and where the fresh fish of the sea furnish them with wholesome and agreeable nourishment.

"In 1799, he had caused to be built for his women, some cabins upon the shores of the lake Onroul; and he himself coasted along the sea shore for the purpose of searching for some mammoth horns. One day he perceived in the midst of a rock of ice an unformed block, which did not at all resemble the floating pieces of wood usually found there. In order to examine it more closely, he clambered up the rock and examined this new object all around; but he could not ascertain what it was. The year following he discovered in the same spot, the carcase of a sea-cow (*Trichecus Rosmarus*). He perceived at the same time that the mass he had formerly seen was freer from the ice, and by the side of it he re-

marked two similar pieces, which he afterwards found were the feet of the mammoth. About the close of the next summer, the entire flank of the animal and one of the tusks had distinctly come out from under the ice. Upon his return to the shores of the lake Onroul, he communicated this extraordinary discovery to his wife and some of his friends; but their manner of regarding the subject overwhelmed him with grief. The old men related on this occasion, that they had heard their forefathers say that a similar monster had formerly shown itself in the same peninsula, and that the whole family of the person who discovered it had become extinct in a very short time. The mammoth, in consequence of this, was unanimously regarded as auguring a future calamity, and the Toungouse chief felt so much inquietude from it, that he fell dangerously ill; but becoming well again, his first ideas suggested to him the profit he might gain by selling the tusks of this animal, which were of an extraordinary size and beauty. He therefore gave orders to conceal carefully the place where the mammoth was, and to remove all strangers from it under various pretexts, charging at the same time some trusty dependents not to suffer any part of this treasure to be carried away.

"But the summer being colder and more windy than usual, kept the mammoth sunk in the ice, which scarcely melted at all that season. At last, about the end of the fifth year afterwards, the ardent desires of Schoumachoff were happily accomplished: the ice which inclosed the mammoth having partly melted, the level became sloped, and this enormous mass, pushed forward by its own weight, fell over upon its side on a sand-bank. Of this two Toungouses were witnesses who accompanied me in my journey. In the month of March 1804, Schoumachoff came to his mammoth, and having got his horns cut off,

he changed them with Baltounoff the merchant for merchandize of the value of fifty roubles. On this occasion a drawing of the animal was made, but it was very incorrect; they described it with pointed ears, very small eyes, horses' hoofs, and a bristly mane along the whole of his back; so that the drawing represented something between a pig and an elephant."

Two years afterwards, being the seventh from the discovery of the mammoth, a fortunate circumstance occasioned my visit to these distant and desert regions, and I congratulate myself upon having it in my power to ascertain and verify a fact, which would otherwise be thought so improbable.

I found the mammoth still upon the same spot, but completely mutilated. The prejudices against it having been dissipated, because the Toungouse chief had recovered his health, the carcase of the mammoth might be approached without any obstacle: the proprietor was content with the profit he had already derived from it, and the Jakouts of the neighbourhood tore off the flesh, with which they fed their dogs. Ferocious animals—white bears of the north pole, gluttons, wolves, and foxes—preyed upon it also, and their burrows were seen in the neighbourhood. The skeleton, almost completely unfleshed, was entire, with the exception of one of the fore feet. The spondyle, from the head to the os coccygis, a shoulder-blade, the pelvis, and the remains of the three extremities, were still tightly attached by the nerves of the joints, and by strips of skin on the exterior side of the carcase. The head was covered with a dry skin; one of the ears, well preserved, was furnished with a tuft of bristles. All these parts must necessarily have suffered by a carriage of eleven thousand wersts. The eyes, however, are preserved, and we can still distinguish the ball of the left eye. The tip of the under lip has

been eaten away, and the upper part, being destroyed, exhibited the teeth. The brain was still within the cranium, but it appeared dry.

The parts least damaged are a fore foot and a hind one; they are covered with skin, and have still the sole attached. According to the assertion of the Toungouse chief, the animal had been so large and well fed, that its belly hung down below the knee joints. This mammoth is a male, with a long mane at his neck, but it has no tail and no trunk. The skin, three-fourths of which are in my possession, is of a deep gray, and covered with a reddish hair and black bristles. The humidity of the soil where the animal has lain so long, has made the bristles lose some part of their elasticity. The entire carcase, the bones of which I collected upon the spot, is four archines and a half high by seven long, from the tip of the nose to the coccyx;* without however comprehending the two horns, each of which is a toise and a half long, and both together weigh ten pouds.† The head alone weighs eleven pouds and an half.

The principal object of my care was to separate the bones, to arrange them and place them in safety: this was done with the most scrupulous nicety, and I had the satisfaction of finding the other shoulder-blade, which lay in a hole. I afterwards caused the skin to be stripped from the side upon which the animal had lain; it was very well preserved. This skin was of such an extraordinary weight, that ten persons who were employed to carry it to the sea side, in order to stretch it on floating wood, moved it with great difficulty. After this operation I caused the ground to be dug in various places in order to see if there were any bones around, but chiefly

* Ah archine is a little more than two feet English measure.

† A poud is forty pounds.

for the purpose of collecting all the bristles which the white bears might have trodden into the wet ground on devouring the flesh. This operation was attended with difficulty, as we wanted the necessary instruments for digging the ground: I succeeded however in procuring in this manner more than one poud weight of bristles. In a few days our labour was ended, and I found myself in possession of a treasure, which amply recompensed me for the fatigues and dangers of the journey, and even for the expenses I had incurred.

The place where I found the mammoth is about sixty paces distant from the shore; and from the fracture of the ice from which it slid is about one hundred paces distant. This fracture occupies the middle precisely between the two points of the isthmus, and is three wersts long, and even in the place where the mammoth was, this rock has a perpendicular elevation of thirty or forty toises. Its substance is a clear ice, but of a nauseous taste; it inclines towards the sea; its summit is covered with a bed of moss and friable earth half an archine in thickness. During the heat of the month of July a part of this crust melts, but the other remains frozen.

Curiosity prompted me to ascend two other hillocks equally distant from the sea; they were of the same composition, and also a little covered with moss. At intervals I saw pieces of wood of an enormous size, and of all the species produced in Siberia; and also mammoth horns in great quantities frozen between the fissures of the rocks. They appeared to be of an astonishing freshness.

It is as curious as it is difficult to explain how all these things are to be found collected here. The inhabitants of the coast call this kind of wood Adamsohina, and distinguish it from the floating wood, which descending the great rivers of Siberia falls into the ocean, and is af-

terwards heaped upon the shores of the Frozen Sea. This last kind they call Noahsohina. I have seen in great thaws, large pieces of earth detach themselves from the hillocks, mix with the water, and form thick and muddy torrents which roll slowly towards the sea. This earth forms in different places lumps, which sink in among the ice. The block of ice where the mammoth was found, was from thirty-five to forty toises high; and, according to the account of the Toungouses, the animal when first discovered was seven toises from the surface of the ice.

The whole shore was as it were covered with the most variegated and beautiful plants produced on the shores of the Frozen Sea; but they were only two inches high. Around the carcase we saw a multitude of other plants, such as the *Cineraria aquatica* and some species of *Pedicularis*, not yet known in natural history.

While waiting for the boats from Terra Firma, for which I had sent some Cossacs, we exerted all our endeavours to erect a monument to perpetuate the memory of this discovery and of my visit. We raised, according to the custom of these countries, two crosses with analogous inscriptions. The one was upon the rock of ice, forty paces from the shelf from which this mammoth had slid, and the other was upon the very spot where we found it. Each of these crosses is six French toises high, and constructed in a manner solid enough to brave the severity of many ages. The Toungouses have given to the one the name of the cross of the Ambassador, and to the other that of the cross of the Mammoth. The eminence itself received the name of Selichaeta or Mammoth mountain. This last will perhaps some day or other afford some traveller the means of calculating with suffi-

cient precision how much the mountains of ice lose annually of their primitive height.

I made two additional excursions for the purpose of acquiring some more precise notions upon the nature of this peninsula, and my discoveries in zoology and botany perfectly answered my expectations. I found a great quantity of amber upon the shores; but in no piece whatever could I discover the least trace of any marine production. I should, perhaps, attribute this to the proximity of the river, and perhaps also to the depth of the sea, or abruptness of the shore. I had occasion to examine more closely the effects of the flux and reflux: this has escaped M. Sauer, who saw nothing of it at the mouth of the Colima.

Our Cossacs not having arrived in time with the boat, I was obliged to return to the continent with my reindeer, without waiting for them. The vessel, in the mean time, had cast anchor in the bay of Borchaya, three hundred wersts from the isthmus where I was. We arrived without any accident, after a journey of eight days. A week afterwards I had the satisfaction to see the mammoth arrive. Our first care was to separate, by boiling, the nerves and flesh from the bones; the skeleton was then packed, and placed at the bottom of the hold. When we arrived at Jakoutsk, I had the good fortune to purchase the tusks of the mammoth; and thence I despatched the whole for St. Petersburgh.

A question of some magnitude remains to be dissolved:—Are the mammoth and elephant animals of the same species, as asserted by Buffon, Pallas, Isbrand Ides, Gmelin, and, above all, Daubenton? or should we, in preference, rely upon the opinion of M. Cuvier, who asserts that the mammoth occupies the second place among the extinct species of animals? As I do not intend, in this place, to make an exact comparison of the skeletons

of a mammoth and an elephant, I shall content myself with relating here some characteristic marks which distinguish the two species: I reserve for a particular memoir some more detailed observations upon this subject. I shall here recapitulate the motives which induced me to adopt the opinion of M. Cuvier.

1. If the writers whom I have mentioned have actually made, as I suppose, zootomical comparisons, they have been able to do so very incompletely, and upon detached pieces; for neither the head, nor the whole vertebræ, nor the feet of the mammoth covered with flesh and hair, and furnished with the sole, have ever yet been examined, when collected together, by any writer.

The presence of the coccyx, which finishes the vertebral column, convinces me that the animal has had a very short and thick tail, like its feet: besides, its being every where covered with bristles induces me to think that they cannot be those of an ordinary elephant.

2. The teeth of the mammoth are harder, heavier, and more twisted in a different direction than the teeth of an elephant. Ivory-turners, who have wrought upon these two substances, say that the mammoth's horn, by its colour and inferior density, differs considerably from ivory. I have seen some of them which formed in their curvature three fourths of a circle; and at Jakoutsk, another of the length of two toises and a half, and which were an archine thick near the root, and weighed seven pouds. It is to be remarked, that the point of the tusks on the exterior side is always more or less worn down: this enables the inhabitant of the Frozen Sea to distinguish the right from the left tusk.

The mammoth is covered with a very thick hair through the whole body, and has a long mane upon its neck. Even admitting that I doubted the stories of my travelling companions, it is nevertheless evident that the bris-

tles of the length of an archine, which were also found upon the head, the ears, and the neck of the animal, must necessarily have belonged either to the mane or to the tail. Schoumachoff maintains that he never saw any trunk belonging to the animal, but it is probable that it was carried off by wild beasts; for it would be inconceivable that the mammoth could eat with so small a snout, and with such enormous tusks, if we do not allow it to have had a trunk. The mammoth, according to these indications, would consequently belong to the elephant species, and M. Blumenbach, in his system, actually calls it *Elephas primævus.*

To conclude:—The mammoth in my possession is quite different from that found near New York, which, from the description given in the Journal called the *Museum des Wundervollen,* had carnivorous teeth.* M. Cuvier has proved in a most satisfactory manner, that the mammoth is a particular species of antediluvian animals.

Another question still remains to be decided. Has the mammoth originally inhabited the countries of the pole, or those of the tropics? The thick hair with which this animal is covered seems to indicate, that it belonged to the northern regions;—to this it does not seem reasonable to start objections, although several writers have done so: but what remains inexplicable is, to ascertain, How came the mammoth to be buried in the ice? Perhaps the peninsula of Tumut has been slowly formed. In course of time a general inundation must have covered all the north part of the globe, and caused the death of this animal; which, after having floated for some time among the masses of ice, was finally driven by a gust of wind upon the sand-bank not far from the shore. The

* See Philosophical Magazine, vol. xiv, p. 162, 228, 332.

sea, upon afterwards retiring within its limits, must have buried the body of the mammoth. But of what use are all these hypotheses, even if they had a high degree of probability?—How can we reconcile facts which seem so contrary? Two years ago similar relics were found in the environs of Kirengsk, upon the banks of the Lena, at a greater distance from the sea, and they had fallen into the bed of the river: others have been found in provinces further south from the Wolga; and they have been discovered in Germany and in Spain. These are just so many incontestable proofs of a general deluge. We must believe that the country of the mammoth was of immense extent: but I shall not at present prosecute inquiries which might lead us into a labyrinth of hypotheses: I shall merely add, that it appears incontestable to me that there has existed a world of a very ancient date; and Cuvier, without intending it, gives evident proofs of this in his system, by the twenty-four species of animals, the races of which are extinct. In the mean time I beg the indulgence of the curious reader in the perusal of this essay. I purpose giving the osteology of the mammoth with all that precision which Camper has devoted to a similar work.

MICHAEL ADAMS.

Petersburgh, August 20, 1807.

No. 45.

New Process for cleaning Feathers from their animal Oil. By Mrs. JANE RICHARDSON.*

The Process.

TAKE for every gallon of clean water, one pound of quicklime; mix them well together, and when the undis-

* Tilloch, vol. 25, p. 67. From the *Transactions of the Society for the Encouragement of Arts, &c.* 1805.—Twenty guineas were adjudged to Mrs. Richardson for this communication.

solved lime is precipitated in fine powder, pour off the clear lime-water for use, at the time it is wanted.

Put the feathers to be cleared in another tub, and add to them a quantity of the clear lime-water, sufficient to cover the feathers about three inches when well immersed and stirred about therein.

The feathers, when thoroughly moistened, will sink down, and should remain in the lime-water three or four days, after which the foul liquor should be separated from the feathers by laying them on a sieve.

The feathers should be afterwards well washed in clean water and dried upon nets; the meshes about the fineness of cabbage-nets.

The feathers must from time to time be shaken upon the nets, and as they dry will fall through the meshes, and are to be collected for use.

The admission of air will be serviceable in the drying. The whole process will be completed in about three weeks; after being prepared as above mentioned, they will only require beating for use.

Mr. Jolly, poulterer, of Charing-cross, attended a committee of the society appointed to inspect the feathers, and stated that Mrs. Richardson had bought from him forty pounds weight of feathers, in the state they were plucked from dead geese, and in such a condition that if they had been kept in the bag only four days, without being cleansed, they would have been very offensive; that the feathers exhibited by Mrs. Richardson appear to be the same he had sold her, but that they were now in a much cleaner state, and seem perfectly cleared from their animal oil.

The committee, in order to authenticate more fully the merits of Mrs. Richardson's process, requested Mr.

Grant, a considerable dealer in feathers, to furnish some specimens of feathers of different kinds in an unclean state, to be cleansed by Mrs. Richardson; in consequence whereof an application was made to Mr. Grant, and the following letter received from him:

SIR—I take the liberty of sending herewith three samples of feathers, on which the experiments may be tried; but should the quantity not be sufficient, on being favoured with your commands, shall with pleasure send any quantity necessary.

The bag No. 1, contains the commonest feathers we ever make use of—it is a Russian produce of various wild fowl; No. 2, gray Dantzick goose; No. 3, a superior kind of Dantzick goose.

The two first are in their raw state, just taken out of the bags in which they were imported; the last have been stoved the usual time, (three days,) but retain their unpleasant smell. Should it not be considered giving you too much trouble, shall be extremely obliged by your favouring me with a line when the experiment has been made, and I shall be happy in waiting upon you to know the result. I am, &c.

THOMAS GRANT.

To C. TAYLOR, M. D. Sec.

After the feathers last mentioned were sent back by Mrs. Richardson, Mr. Grant attended to examine them, and declared that they appeared to be perfectly well cleaned.

Certificates from Mr. Christopher Bushnan, Chelsea, and from Mr. W. Baily, testified to the efficacy of Mrs. Richardson's process.

No. 46.

New Method of cleansing Silk, Woollen, and Cotton Goods, without damage to the texture or the Colour. By Mrs. Ann Morris.*

Take raw potatoes, in the state they are taken out of the earth, wash them well, then rub them on a grater over a vessel of clean water to a fine pulp, pass the liquid matter through a coarse seive into another tub of clear water; let the mixture stand till the fine white particles of the potatoes are precipitated, then pour the mucilaginous liquor from the fecula, and preserve this liquor for use. The article to be cleaned should then be laid upon a linen cloth upon a table, and having provided a clean sponge, dip the sponge in the potatoe-liquor, and apply the sponge thus wet to the article to be cleaned, and rub it well upon it with repeated portions of the potatoe-liquor, till the dirt is perfectly separated; then wash the article in clean water several times, to remove the loose dirt; it may afterwards be smoothed or dried.

Two middle-sized potatoes will be sufficient for a pint of water.

The white fecula which separates in making the mucilaginous liquor will answer the purpose of tapioca, will make an useful nourishing food with soup or milk, or serve to make starch and hair-powder.

The coarse pulp which does not pass the sieve is of great use in cleaning worsted curtains, tapestry, carpets, or other coarse goods.

The mucilaginous liquor of the potatoes will clean all

* Tilloch, vol. 25, p. 71. From the *Transactions of the Society for the Encouragement of Arts, &c.* 1805.—Fifteen guineas were voted by the Society of Arts to Mrs. Morris, for communicating this new process.

sorts of silk, cotton, or woollen goods, without hurting the texture of the article, or spoiling the colour.

It is also useful in cleansing oil paintings, or furniture that is soiled.

Dirty painted wainscots may be cleaned by wetting a sponge in the liquor, then dipping it in a little fine clean sand, and afterwards rubbing the wainscot therewith.

Various experiments were made by Mrs. Morris in the presence of a committee, at the society's house: the whole process was performed before them upon fine and coarse goods of different fabrics, and to their satisfaction.

No. 47.

List of American Patents.

(Continued from page 160.)

1808.

Antoine Boucherie, Jan. 8, improvement in making and refining sugar.

Eli Barnum, Jan. 9, machine to facilitate the making of boots and shoes.

Oliver Evans, Jan. 22, machine for manufacturing flour and meal.

Jonathan Hicks, Jan. 28, nail cutting machine.

John F. Gould, Feb. 1, improvement in fire places or open stoves.

Samuel Dodge, Feb. 9, improvement in the fanning mill for grain.

William Bent, Feb. 24, machine for splitting leather and skins.

Hezekiah Harris, Feb. 24, improvement in the plough.

Dan. Watson, March 4, improvement in the common suction pump.

Philemon Heaton, Mark B. Boyes, and Philemon Heaton, junior, improvement in propelling boats.

Robert Fulton and Nathaniel Cutting, March 4, machine for manufacturing cordage and improving its quality, &c.

Phineas Pratt, March 5, machine for making combs.

Simeon Hays, March 8, improvement in churns.

Eleazer Cady, junior, March 9, a forcing pump with double action, applied to engines, &c.

Nicholas King, March 10, a revolving churn.

Stephen Stackhouse, March 11, improvement in the churn.

Giles Gridley, March 13, improvement in chimneys.

Giles Gridley, March 14, improvement in fire places.

William Wadsworth, March 15, a washing machine.

William Wadsworth, March 15, machine for propelling boats, &c.

Obadiah Pease and Asher Donalds, March 18, machine for grinding bark and dye woods.

Ebenezer Benedict, March 21, improvement in the cyder and cheese press.

Eli Barnum and Benjamin Brooks, March 21, machine for distilling or boiling water.

John Johnson, March 21, a wheel to run under water.

William W. Townsend, March 22, improvement in churns.

Oliver Barret, jr. March 23, a fanning mill for grain or clover seed.

Roswell Hopkins, March 25, a lever for turning wheels, for rowing boats, &c.

Ele. Smith, March 30, machine for trimming straw plat, for bonnets.

Jedediah Tallman, March 31, mode of applying power and causing motion to machinery by the pendulum.

Joseph Poudrell, April 6, an economical furnace or stove.

Thomas Cohoon, April 11, cross cut saw machine.

Robert Kilborn, April 12, improvement in lessening the friction in axletrees of carriages, &c.

Ephraim Warner, April 12, improvement in cheese presses, &c.

Thomas Cohoon, April 13, machine for breaking and swingling hemp and flax, &c.

Thomas Cohoon, April 14, improvement in the screw press.

Ira Ives, April 14, improvement in faucets for drawing liquor from casks.

William Coolidge, April 18, machine for smoothing and polishing paper and other substances.

Samuel Frothingham and George Harris, April 20, mode of striping alum dressed leather for shoe binding, &c.

John Fairbanks, April 21, a cylindric ruling machine.

Daniel Pierpont, April 22, improvement in the churn.

Timo. Cruttenden, April 23, improvement in the spinning wheel.

Roswell Pitkin, April 23, improvement in manufacturing hats, cloths, &c. from a fleece or sheet taken from a carding engine, without bowing.

Aaron Reed, April 25, improvement in the churn.

David Cobb, April 25, improvement in carriages for field artillery.

Nehemiah Howe, April 25, improvement in the churn.

Joseph Reeve, April 25, improvement in preparing and making twisted whalebone whips.

Benjamin Taylor, April 25, mode of impelling boats, water or land carriages.

Isaiah Jennings, April 25, machine for making rivets.

Daniel Rider, April 26, machine for making oakum.

Leonard Kennedy, April 26, a washing machine.

Ebenezer Stowell, April 26, machine for shearing woollen and other cloths.

Benjamin Dearborn, April 29, the anglet for taking and laying down angles.

Elam King, May 14, a washing machine.

Reuben Ainsworth, May 14, improvement in making pearl ash, in kettles, without the use of ovens.

William Flower, May 15, the life buoy, or seaman's friend.

John Bailey, junior, May 16, a friction roller door hinge.

Will. Rhodes, May 16, improvement in the construction of pumps.

William Rhodes, May 16, a floating dry dock for cleansing the bottoms of vessels.

Simeon B. Willard, May 18, improvement in the churn.

Rob. P. Cunningham, May 21, improvement in pressing machines.

Samuel Barber and Nehemiah U. Tompkins, June 1, improvement in the application of the whip saw.

Caleb Johnson, June 3, improvement in the double lever press for tobacco, &c.

Jesse Reed, June 3, machine for rasping dye woods.

En. Ives and Jerry Hill, June 3, improvement in carriage springs.

Samuel Stilwell and Daniel T. Wandall, June 3, apparatus for propelling boats across rivers by force of the current.

Martin Lee, June 4, improvement in washing machines.

Robert Patton, June 13, machine for washing, churning, and getting out clover seed, &c.

Joseph Jellef, June 14, machine to cut and head nails.

James Finley, June 17, improvement in the chain bridge.

Jonathan Mix, June 17, thorough-brace springs for carriages.

Allen Pollock, June 17, improvement in stoves, &c. for heating rooms.

Ebenezer Benedict, June 18, improvement in the cyder and cheese press.

Ebenezer Jones, June 20, a perpendicular washing machine.

Ebenezer Jones, June 20, machine for sawing stone, wood, &c.

Simson Stewart, Ebenezer Hovey, and James Henderson, June 21, machine for shearing cloth.

David Burt, June 22, a hydrant for drawing water from aqueducts.

Osborn Parsons, June 23, improvement in rectifying spirits.

Winslow Lewis, June 24, improvement in lighting the binnacle of ships.

Robert Ramsey, June 24, improvement in making conduit pipes, &c. from clay, &c.

John Henry Ross, June 24, an illuminator for lighting stair cases.

James Armour, jr. June 27, folding or spiral springs for carriages.

Ezekiel Olds, June 29, machine for splitting boards, planks, &c.

(To be continued.)

INTELLIGENCE.

*Curious Fact.**

In the capital of the beautiful kingdom of Valencia, I learned the following facts from eye-witnesses. A silk weaver kept a stallion and a mule in the same stable. One night in winter the mule was taken ill, rolled on the ground, and appeared ready to die. At last it brought forth a foal, so well formed that the finest mare could not have produced a better. The stallion and mule were left together during eight years, in which time the latter brought forth five male and two female foals.† Now the mule was half horse, half ass; its offspring were half horse, half mule. But, will it be said that the latter, which were perfect horses, contained a portion of the ass, which portion of ass might have passed by the mule to become horse? Most assuredly no sensible person will say so. Nature has not instituted the mule species; and when in successive generations all traces of the ass are effaced in the foals of the mule, it is Nature which resumes her rights, and puts a limit to a race of monsters.

* Tilloch, vol. 36, p. 390. From *Reflections on some Mineralogical Systems.* By R. Chenevix, Esquire, F. R. S. &c.

† As this fact has been questioned by some French theorists, from the forced and miniature experiments of Buffon, it is not foreign to the present subject to say, that the writer of this note has also heard it from unimpeachable eye-witnesses who were well acquainted with the whole circumstances, and that he knew a gentleman, an amateur mineralogist in Valencia, who found one of the offspring of the mule the most serviceable horse that he ever possessed.—*Translator.*